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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

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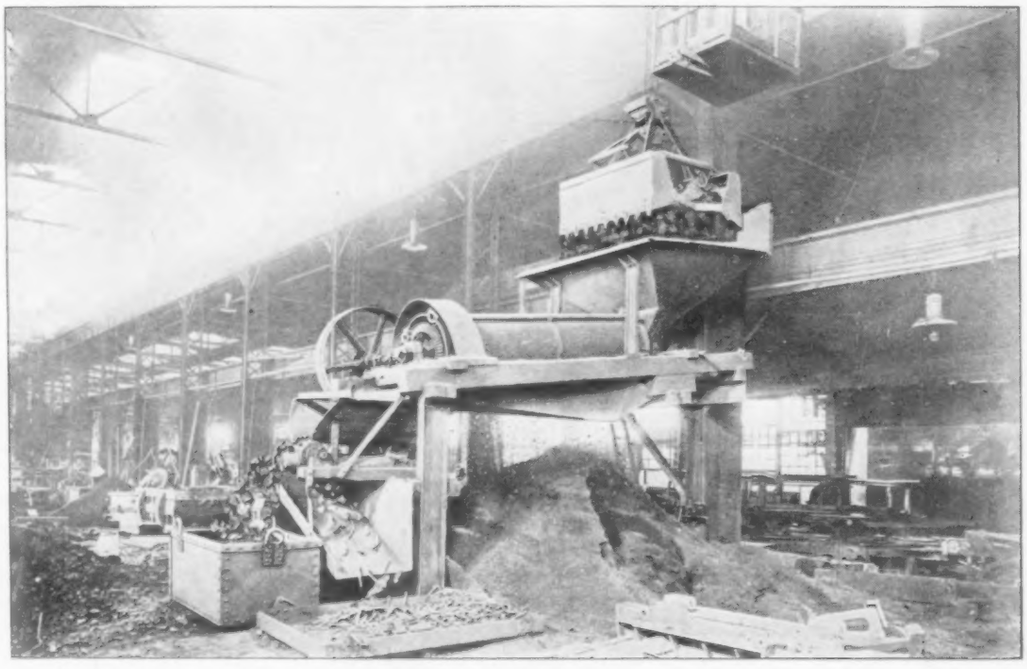

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THE METAL INDUSTRY
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ELECTRO-PLATERS REVIEW.

Vol. 19 NEW YORK, MARCH, 1921 No. 3

Meeting of the Institute of Metals Division

An Account of the Meeting Held in New York, February 15, 1921

The winter meeting of the American Institute of Mining and Metallurgical Engineers was held in New York, February 14 to 17. As part of this session the Institute of Metals Division held its meeting, Tuesday, February 15, with W. H. Bassett presiding. The following papers were read and discussed:

1. The Effect of Temperatures, Deformation, Grain Size and Rate of Loading on the Mechanical Properties of Metals, by W. P. Sykes.
2. Artillery Cartridge Cases. By J. Burns Read and S. Tour.

W. H. BASSETT, CHAIRMAN

OFFICERS ELECTED

Before the reading of the papers the business of the meeting was completed. This business included the secretary's report and the election of officers.

According to the report which was read by G. M. Fritsch, for W. M. Corse, the division now includes 943 members. The balance of cash on hand amounts to $1,863.97. The meeting with the American Foundrymen's Association in Columbus was a decided success. The report was accepted without a dissenting vote.

The nominating committee turned in its report, which was also accepted unanimously, and all the men on its list elected. The new officers are as follows: W. H. Bassett, chairman; W. M. Corse, secretary-treasurer; vice-chairman and members of the Executive Committee are as follows: P. E. McKinney, W. B. Price, H. J. Roast, P. D. Merica, C. H. Bierbaum, F. L. Wolf, C. H. Mathewson, W. F. Frank, W. A. Cowan, G. K. Elliott.

The Effect of Temperatures, Deformation, Grain Size and Rate of Loading on the Mechanical Properties of Metals, by W. P. Sykes.

Evidence has been produced to establish the types of curves that represent variation in tensile strength, elongation, and reduction of area with variation in temperatures for all metals. These basic curves are subject to variations produced by any allotropic change that may take place in the metal under consideration.

Excluding allotropic changes and other specific characteristics, all metals possess the same fundamental properties and those exhibited by any one metal are functions of the temperature at which the observations are made.

The maximum reduction of area by fracture in tension occurs in a piece of metal in which single grains occupy the entire cross-section. In the case of two aggregates, the one of smaller grain size suffers the greater reduction.

The ultimate result of decreasing temperature is a complete loss of ductility and probably eventually a reduction in tensile strength. Brittleness is first observed in metals having equiaxed structures. The smaller the grain size of a sample the lower is the temperature to which ductility is preserved.

Deformation of a metal below its annealing temperature makes its maximum ductility at any temperature below that of working less than that of the same metal in the unworked condition. But the worked sample will retain its power of elongation to a lower temperature.

Artillery Cartridge Cases

This paper was read by Mr. Tour. Unfortunately no printed copies were available, making discussion rather difficult. The authors explained that the cases were cold worked out of brass disks. This necessitated that the disks be of high quality, that the tools should be accurate and that annealing between operations should be carefully and accurately controlled.

W. M. CORSE,
SECRETARY-TREASURER

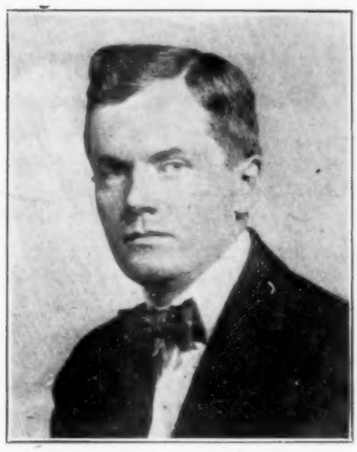
Various tests were used. Originally only the ballistic test was employed together with the chemical specification. Since then, however, other tests were added, and particularly mercuric chloride or mercurous nitrate. The test was particularly valuable for its ability to predict

Vice Chairmen of the Institute of Metals Division

Elected February, 1921

W. B. PRICE

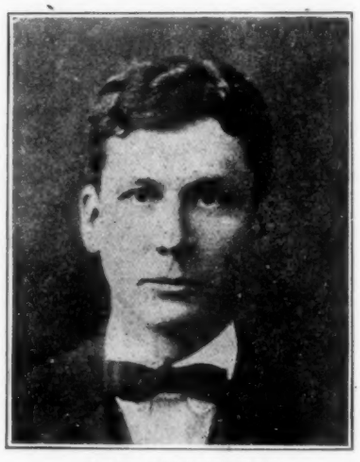
H. J. ROAST



P. D. MERICA

C. H. BIERBAUM

F. L. WOLF



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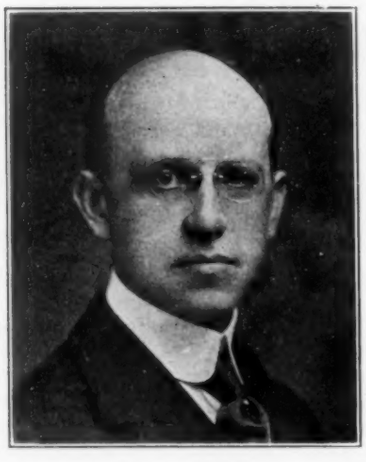
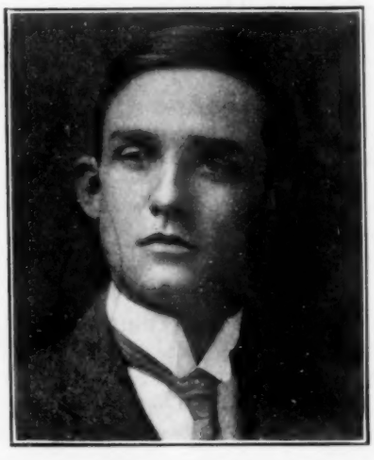
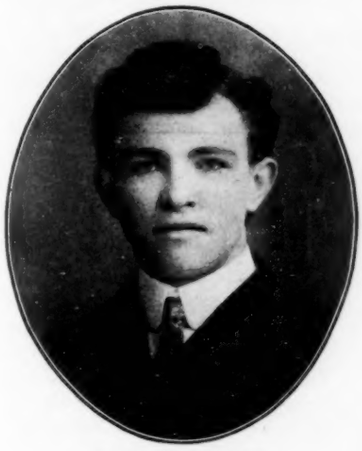


W. A. COWAN



G. K. ELLIOTT

season cracking, which could not be foretold by any other chemical or physical test. The authors stated that here was very little choice between the mercuric chloride and mercurous nitrate tests, except that the latter would work much more rapidly. It was recommended, to avoid season cracking, that one or more of the following methods be used: (1) Increase work during the last redraw; (2) increase the temperature and time of anneal; (3) increase both the work and the anneal; (4) redesign of tools and working operations in manufacturing to overcome excessive variations in strain between different parts; (5) a final low temperature anneal.



P. E. McKINNEY

Mr. Bassett stated in commending the paper that it represented an enormous amount of work done by the Ordnance Department, and that it was a most valuable record for future use in brass drawing operations.

G. E. Dalbey asked whether the mercuric chloride test was adaptable to the leaded yellow brass of 60-40 proportions (with about 2 to 3 per cent lead), such as tubing. Mr. Bassett answered that the mercurous nitrate test was standard for almost all copper zinc alloys. It was not especially adapted for tubing, but should work. It was a rapid corrosion test showing internal stresses. The result of the attack of mercurous nitrate on the material between the crystal grains was the cracking along these lines wherever there was excessive strain.

Mr. Carter asked if season cracking meant excessive work and also asked if brass cracked during the annealing process. Mr. Tour answered that cracking was caused not by excessive work, but by excessive difference in the amount of work on different parts of the same piece, causing unequal strains. Mr. Bassett added that he agreed with Mr. Tour's explanation. Fire cracking was caused by the same thing; unequal strains which existed in the parts took effect in the too rapid heat.

Coremaking Machines

Their Possibilities and Limitations

Written for The Metal Industry by WILLIAM H. PARRY

The coremaking machines in use today have barely caught up in output per unit with the molding machines now on the market. In many foundries specializing in intricate and complicated castings, such as automobile cylinder blocks, the hand-made cores are still in evidence, because there is not any one coremaking machine manufactured that will entirely answer their purpose.

On the other hand, where coremaking is not about 75 per cent of the total labor cost, the coremaking machines have made good when intelligently handled. Among the pioneer machines that survived actual coreroom operation long enough to be hailed as successful, are the kind using a screw feed in an enclosed cylinder to force the sand into and through dies or tubes of various shapes, mostly round, their length being determined by holding qualities of the core plate at the discharging end.

These machines have served, and are serving, their purposes, but as they are limited in range and scope, they do not commence to approach that dream of foundrymen, the perfect coremaker. The same can be said of the plunger type, though they have been discarded by almost all users because of their unreliability.

The rockover drop machine has the widest range of any on the market today, with the possible exception of the jarring type, and there are quite a few machines made at present that embody both of these features, and give good service to their users on various classes of work. Possibly the greatest drawback in using machines on medium or heavy work when core arbors must be used is the proper placing of the arbors prior to, or at least during the period occupied in, making the core. This problem is often solved by making the arbors long enough to project through the print spaces and rest on notches cut in the corebox ends, or, if it is not desirable to have the arbor ends project through, wooden blocks are fastened in the coreprint spaces of the corebox for it to rest on.

The possibilities of the core blowing machine seem to me to be limitless. Just now there are but two makers in the field, one of whom builds a machine of tremendous proportions and weight, yet limits its coremaking volume to a couple of hundred cubic inches. The other manufacturer has very much simplified this type of machine, in that it has the fewest possible moving parts and is of the smallest dependable proportions, with a core volume in excess of its cumbersome competitor.

Core blowing machines force the sand into the coreboxes by compressed air in pressures varying from 60 to 100 pounds, and do so at the rate of six to eight a minute. On the older type of machine at least two operators are necessary to keep pace with its loading and unloading gait, and as there is no provision made to trap the sand automatically in the hopper, one operator at least receives a sand bath whether he needs it or not, if he fails to place the corebox in the clamp at the proper moment.

On the newer machine the operator sets his own gait, thus sand baths are not as apt to occur, but on the other hand, the pace of this machine is not as fast as that of the older make.

While waiting for the development of the perfect coremaking machine, let us consider the possibilities of the gang, group or multiplex corebox, which on small work can be made to produce as many cores as one man can set in the molds in the same space of time.

Strictly speaking, this type of corebox is not a machine, in the sense that it is power-driven, but in the hands of a good operator such coreboxes very frequently do produce more good cores than any machine can possibly make. Again, cores can be made with this type of corebox that cannot possibly be made on any machine. This is particularly true when cores must be vented and wired to retain their original shape while being baked.

The use of dryers in conjunction with the multiplex corebox is pretty near perfection in core production, and there is a doubt that coremaking machines will ever arrive at that state of perfection to overcome the advantages of this method on many classes of work.

One of these coreboxes designed to make twelve cores as easily as two could be made with a single unit corebox, turned out so much work in less than one hour that it was given a rest of seven hours' duration every day during the run of that job, though it is only fair to state that core plates just big enough to hold the dozen cores were a very essential part of the outfit.

Producing Small Nonferrous Castings

A Paper Presented at the Columbus Meeting of the American Foundrymen's Association, Oct. 4-8, 1920

By RAYMOND H. SULLIVAN, Yale & Towne Manufacturing Company, Stamford Conn.

Although this paper was read originally, some time ago, it has not been republished since, and as all foundrymen do not have the opportunity to hear the papers at the meetings of the A. F. A., we believe this description of the methods of a large manufacturer will be of great interest.—Ed.

The object of this paper is to outline the problem of producing daily a large number of small duplicate nonferrous castings and to describe a method of solution.

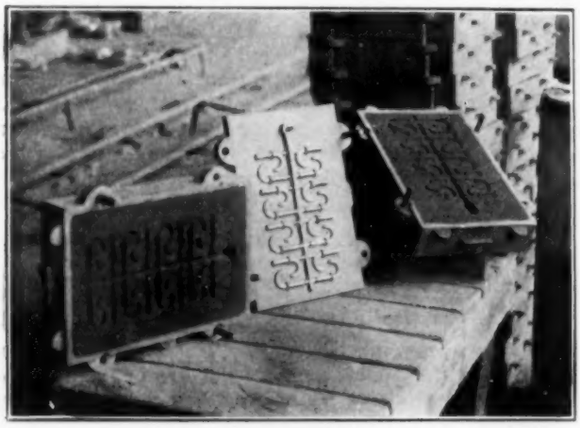


FIG. 1. PATTERN FOR MOLDING PADLOCK SHACKLES

Many of these castings are machined for interchangeable components in the productive output of a large manufacturing establishment. The examples and illustrations which follow are taken from the practice in the brass foundry of the Yale & Towne Manufacturing Company, Stamford, Conn.

THIRTY BASE FORMULAE USED

While this paper deals with the production of one particular article from the base metals to finished castings, the principle involved is typical of several thousand somewhat similar castings varying in shape, size and composition. Some 30 base formulae are used in the composition of the various castings, the composition depending upon the use of the metal in the finished product. The castings range from bronzes involving high tensile strength and a large percentage of ductility to clear, soft, high finish brasses and bronzes, where colors are the prime requisite rather than strength.

While the processes described are employed in quantity production, castings are not produced under continuous operating conditions, day in and day out; consequently the greatest application of semiautomatic or full automatic equipment, such as traveling conveyors or rotating tables, etc., for handling molds, cannot be utilized. It is fully realized that where small identical castings are produced day in and day out, year in and year out, a much more efficient method than described herein can be applied.

ORDERS RANGE FROM TWO TO FIFTY THOUSAND PIECES

This description, therefore, is intended to show how production is obtained in a large foundry, with a large variation in output of small brass and bronze castings in quantities varying from two to 50,000 pieces per order, and which run in production time on one set-up of molding machines from three days to three months.

Incidentally, the author believes that some experimental work in electric melting of nonferrous alloys in comparison with that of oil melting would be of interest to those interested in nonferrous foundry practice.

The manufacturing establishment whose foundry practice is described in the following, has been engaged in extensive experimental work with electrical melting and the results obtained are included herein. These experiments are still in progress and have not been finally completed, in that further confirmation and checks of the results shown are desired. The experiments, however, being in line with advancement and progress in the state of the art of nonferrous foundry practice, are interesting in that they apparently closely check the claims made by manufacturers of furnaces and those investigators of electric melting who have published their results. The fact that nonferrous castings of 40,000 different parts are ordered from the foundry during the normal year, of which approximately 10 per cent are ordered in large quantities, necessitates careful planning and close adherence to the plans, in order to insure delivery of the castings when required.

HOW PRODUCTION SCHEDULE IS PLANNED

The basis for this planning is a schedule issued each half year. This schedule consists of quantities of units, the quantities being based on the sales of the preceding six months and the judgment of the sales and stock organizations in conference. From this schedule, which is in terms of product units, a plan is laid out to cover the manufacture of each of the parts entering into these units, in each of the various departments in which work is performed on them. This plan is received in the brass foundry by a dispatch clerk, who is the representative of the

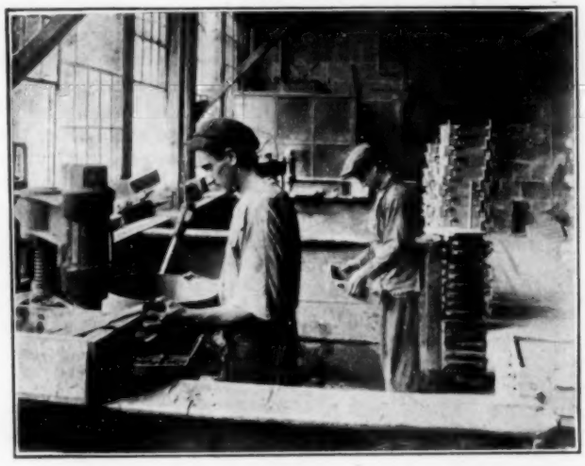


FIG. 3. EVERY MOLDER HAS HIS HELPER

production bureau, a part of the executive organization which controls and plans production throughout the plant. The dispatch clerk immediately enters requisitions for the manufacture of cores, based on the actual working time to produce them and to insure their delivery a day in advance of the date upon which it will be necessary to start the actual molding in order to meet the plan. The molding date is calculated from the actual man hours

required to produce the quantity of castings on any order. The dispatcher also orders patterns to be delivered from the pattern vault a day in advance of the actual molding date. These patterns are delivered to the pattern rack in the foreman's office and represent the work which he must have in the sand on the succeeding day. By using a tickler system, the dispatcher can be certain that the cores and patterns are actually delivered at the required time.

The foundry foreman, by using the information of the dispatch clerk and in close co-operation with him, has an opportunity to know a considerable time in advance whether the required production is increasing or decreasing and is enabled to plan accordingly.

PLOTS DELIVERY AGAINST REQUIREMENTS

As an additional control against the possibility of failure to produce, a curve showing the total delivery of castings for each class of product, as against the required delivery, is maintained in the production bureau office. These records, while they do not indicate detailed failure, do reveal tendencies toward tardiness, and lead to close inspection of the detailed records in the foundry dispatch clerk's office. It is thus readily seen that a specific production failure is quickly discovered.

The foreman of the foundry, having compared his scheduled requirements with his average production and plan, can practically limit his attention to the actual molding and foundry operations, giving out his work from the pattern rack a day in advance of the time for starting molding.

The component selected for detailed description is a padlock shackle, known by the list No. 805.

The pattern shown in Fig. 1 consists of a gate of 16 pieces which is permanently fastened to a cast iron plate containing one-half of the gate and castings which make a complete mold when the cope and nowel halves of the mold are placed together, as shown in Fig. 1.

METHOD OF MOLDING

The molding is done on an air squeezer machine. The cope and nowel are made from the same pattern and a sprue is provided for in the cope board. Care must be exercised by the patternmaker in setting the pattern exactly in the center of the plate, otherwise a shift will occur, spoiling the casting. Fig. 2 shows the general layout of the molding floor, including a number of molding machines. A number of gates of finished castings also are shown.

The molder is provided with a helper, Fig. 3, whose duty it is to graphite the flask pins and carefully clean the flanges of the metal flasks, thereby preventing a possibility of a thicker casting than desired. He likewise sets the finished mold on the pouring rack, puts the weights on and, after a rack of molds is poured, shifts the weights and breaks off the sprue heads of the hot molds. The results of these various operations can be noted in Fig. 2.

Each two molders have one extra helper who dumps the molds, removes the castings and puts back the empty flasks at the molders' benches. This being done, he wets and cuts the sand.

FIG. 2. GENERAL VIEW OF MOLDING FLOOR OF FOUNDRY

Upon completion of the day's work, the three helpers clean up the two floors and return the backstock to the metal cage, where a responsible man is stationed to see that it is not mixed with other metals of different composition.

The hot metal for the castings is carried to the molders by two-bar holders in a No. 25 crucible, which has been previously preheated, Fig. 4. The molder skims and pours his own metal, and in this way becomes so well acquainted with the heat that he can readily decide when his metal is at the proper pouring temperature. Molders are chosen from the above mentioned helpers by careful observation of the foremen and, with systematic training by regular instructors, are developed into competent workmen.

After the castings are dumped from the molds and sufficiently cool for handling, they are taken by truck to the cutting off room, where they go through the following operations.

First they are chopped from the gates, each man's work being kept separate. The gates are likewise kept separate in order to avoid the mixing of the different metal mixtures. An interesting innovation was just installed.

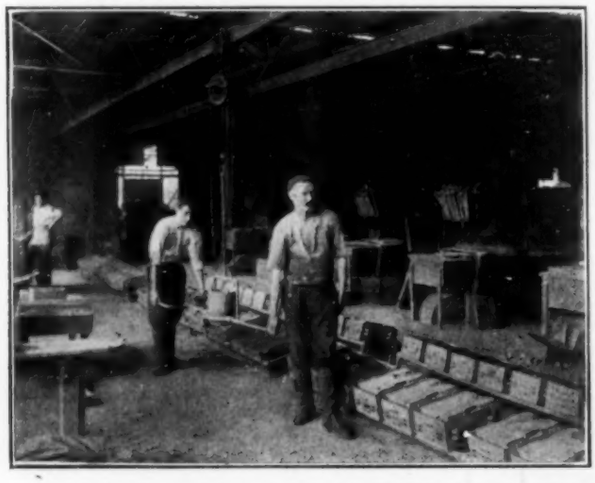


FIG. 4. METAL IS CARRIED TO MOLDS IN NO. 25 CRUCIBLES

This consists of an air hammer used to vibrate gates of castings containing cores. This system quickly and efficiently removes the cores from the entire gate of castings.

Next, the castings are removed to the grinders who grind off the balance of the gate left on by the choppers. From the grinders the castings are removed to the sand blast machines, Fig. 5, where they are sand blasted for approximately 10 minutes, after which they are taken to the inspectors, who carefully separate the good work and make their returns on a ticket for the benefit of the timekeeping department. Molders are paid only for good castings. These operations having been completed, the castings are tumbled in wet tumbling barrels, Fig. 6, for about seven or eight minutes, when they are weighed and shipped according to designated routing on a special "move" ticket.

SAND BLAST CASTINGS ON GATE

An alternate procedure is frequently followed in the cutting-off room. Instead of first chopping the castings from the gate they are sand blasted on the gate, and then chopped and ground. By this method, the blackstock is rid of the undesirable sand which clings to the gate and gets into the heat in which this backstock is used. It is likewise preferable to the choppers and grinders from a standpoint of cleanliness. This method, however, is slower, and therefore is not used except occasionally when operating conditions seem to warrant it.

A molder on this pattern averages approximately 20 molds per hour, giving a production of about 180 molds per day, 16 pieces per mold, or in all about 2,880 castings. Deductions are made in the molder's pay should losses occur due to faulty work on his part. This has a tendency to keep the molder on the lookout for pouring his

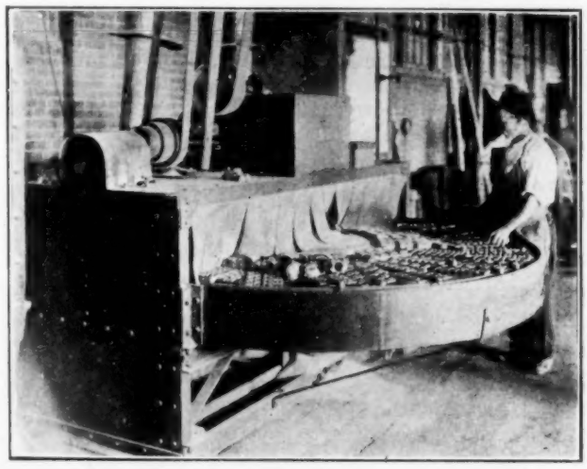


FIG. 5. CASTINGS ARE SAND BLASTED FOR TEN MINUTES

metal properly and prevents his putting up molds in a careless manner.

A very exact and convenient means of setting cores for a mold requiring numerous cores is used. A plaster paris mold is made which corresponds to the mold in which the cores are to set. The core setter sets the cores on the plaster paris mold and the molder, on completing his nowel half, sets it on the plaster mold. Upon reversing the nowel prior to placing the cope half, we find the cores neatly set without disturbing the sand in the nowel. This method has proved to be very advantageous and is now used to a great extent.

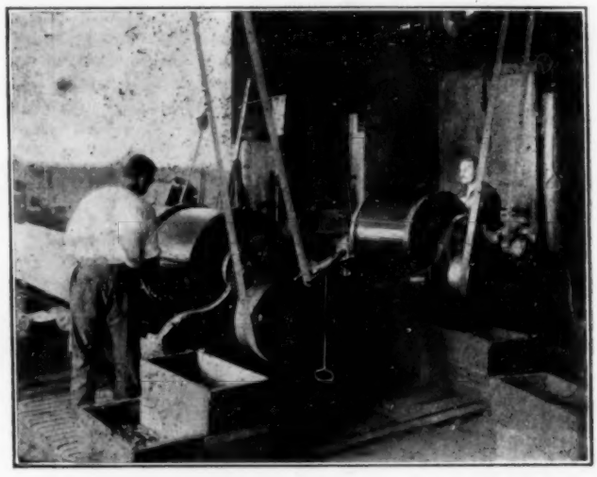


FIG. 6. CASTINGS ARE TUMBLED IN WET TUMBLING BARRELS

SCRAP IS SALVAGED

Several of the metal mixtures in use contain some turnings or scrap. Brass and bronze scrap from all over the works is sent to the salvage division, where that part of it considered satisfactory for use without refining is selected and stored in the melting room. The skeleton scrap and defective castings and all of that scrap which is likely to contain iron parts is screened and a hand magnet run through to remove iron or steel parts. The

turnings are run through riddlings and magnet machines and the rod turnings burned to remove the oil. A part of this scrap in turnings is then analyzed and recorded to permit of a correct mixture when the new metal is added.

All of the new metal is stored in a metal cage and upon being issued to the melter, the weight of the charge is carefully checked three times.

The metal for casting the shackles is regularly melted in oil furnaces in crucibles. Experiments with electric melting are now in progress and seem to meet with success.

In oil melting, a melter supervises the melting for three furnaces, with a helper for each two furnaces. An hour in advance of the time for the molder to commence work in the morning, the melter with his helper weighs out one day's supply of scrap and turnings. This scrap is fed to the furnace as fast as it melts down and when just hot enough to pour, is cast into ingots.

FOUR HEATS A DAY'S WORK

Four heats per furnace of 170 pounds each is considered a day's work. These ingots are then reweighed by the melter and the new metal for each charge drawn from the metal cage. The charge is melted down from ingots and new metal in proper ratio and covered with charcoal before it reaches a temperature at which it is easily oxidized and remains covered until poured. It is then carried to the molds in No. 25 crucibles, by means of an overhead trolley system, as shown in Fig. 5, the crucibles having been preheated to a temperature depending upon the size of castings to be poured. Four heats of 170 pounds per day is the task for this work, the molders working from 6 a. m. until about 4:30 p. m. At the end of the day's work the melter gives the cage checker a card showing the amount of metal melted, and this is checked against the amount of alloy issued to him. All ingots which have been poured by a melter are weighed and stored in the metal cage each day.

In the experiments now being undertaken with electric melting, the following procedure has developed.

The handling of the metal up to the point of charging the scrap and turnings to the furnace is exactly the same as in the oil furnace. Approximately 200 pounds of turnings and scrap mixture are charged into the furnace and heated for about 20 minutes at from 40 to 50 kilowatt-hours. The furnace is oscillated to mix this melt at intervals of approximately two minutes until the input reaches 80 kilowatt-hours, when the mixing process is operated continuously until approximately 100 kilowatt-hours have been used. The new metal is then charged and the heating continued until about 110 kilowatt-hours have been consumed. No charcoal is used, there being but small openings through which the metal could be exposed to the air. The molten metal is then carried to the molds in exactly the same manner as that used with the oil furnace. Six heats of approximately 600 pounds can be melted per day.

NEW METAL ADDED DIRECTLY TO SCRAP

With this method the scrap is not molded into ingots but the new metal is added directly to the molten scrap and turnings. At the end of the day's run the melter gives the cage checker a card showing the total amount of metal melted and this is checked against the amount issued against him. The elimination of making scrap into ingots results in a very large saving.

The experiments thus far indicate that electric melting is considerably more economical than oil melting. In melting direct from the oil furnace into the molds the experiments indicate that electric melting saves about 38 per cent. When double melting is employed in using turnings, melting first into ingots, then ingots remelted with new metal, a gain of about 70 per cent is indicated by the experiments with electric melting.

In conclusion, the writer wishes to bring to the notice of the readers several factors which must be considered in the analysis of quantity production of nonferrous alloys. The problem of producing continuously quantity production of the same identical article is very different and much more simple than producing large quantities for a short period of time, with a variation of composition. In the former case greater application of automatic and semiautomatic devices can be applied.

RECORDS ARE IMPORTANT

Too much emphasis cannot be made upon the importance of records, not only of composition and analysis, but records of production, output, backstock, losses, reclamation, output per molder, etc. Records to the production foreman or superintendent are a large factor in guidance in obtaining efficiency of operation. Efficiency of operation is the basis of low costs in production.

The conclusions to be drawn from the experiments of electric melting described, indicate that the trend of nonferrous foundry melting is rapidly leading to the adoption of electric melting.

No attempt in this paper is made to describe the various types of electric furnaces, as the writer believes that each particular foundry must make a thorough analysis of the various types of furnaces and systems of melting now offered by the manufacturers and by a process of elimination, determine upon the particulad type or system best adapted to its product.

BRONZE SAFETY TROPHY

As a stimulus to the safety movement in its plants, the Carnegie Steel Company has placed the safety work on a competitive or sporting basis, its thirteen units being the competitors for a trophy that has been offered by the company. The trophy is a bronze statuette symbolizing safety. It stands twenty-six inches high and is ten inches in diameter through the base. The trophy is the composition of Moretti, of Pittsburgh, and the piece is the first attempt to symbolize safety. The trophy was put in competition the first of the year, and is to be awarded monthly to the plant making the best record for safety, and making the best percentage in a ranking report based on the least number of accidents that cost loss of time, in proportion to the men employed. As each plant wins the trophy it will be held by that plant for the succeeding month; the name of the plant is to be inscribed on the base, with the name of the month for which it was awarded, and at the end of the year that plant winning the trophy the greatest number of months becomes the perpetual holder.

BRONZE SAFETY TROPHY

The casting was made by the Roman Bronze Works, of New York City, and is an excellent example of a "thing of beauty," aided in its preparation by the foundry.

Seamless Tubing

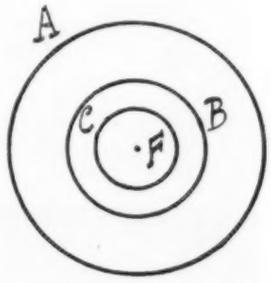
A Description of Improved Methods for the Production of Copper, Brass and Steel Tubing

Written for The Metal Industry by LUDWIG WOLFFGRAM, Consulting Engineer, Erie, Pa.

Seamless copper and brass tubes, such as handled by the trade, can, according to my experience, be turned out in the best way by Three Roller System rolling mills. In order that the quality of the finished tubes, such as elongation, tensile strength and structure of the metal, may meet all requirements, and to avoid any unevenness in the tube-walls, particular attention must be paid that the rolling tube is being inserted into the rolling mill (piercing mill) in the proper manner. The latter must be constructed in such a way so that the taper (which forms on the billet when it enters between the three rollers) is straight, and this can be accomplished only when the shapes of the rollers are not alike. Their circumference, however, must conform exactly to the taper which it is expected to form on the billet.

In a great many instances this is not being observed as strictly as it should, the result being a lessening of the speed of the material in the piercing mill, causing it to crystallize, and also resulting in an uneven wall-thickness.

A most rapid development of the rolling tubes out of the billet between the three rollers, above the arbor, is necessary in order to contribute toward obtaining the desired tensile strength, elongation, structure and surfaces of the rolling tubes. This is being accomplished by having the working surface of the rollers as short as possible, upon which the tube, above the arbor, is forming so that there will be no unnecessary friction of the material.



In this way it is possible to obtain a speed of one foot rolling tube per second, and also the utmost capacity upon the rolling mill, without injuring the quality of the tube material.

It is a further, absolute necessity to give the rolling mills the proper number of revolutions, to suit the billet dimensions, and it is wrong to reduce the speed of rolling mills when turning out tubes of larger dimensions, from that employed when producing smaller dimensioned tubes. This is the reason why rolling tubes of large dimensions, when turned out upon slowly running rolling mills, show an uneven wall-thickness.

The manufacture of rolling tubes may be compared, for instance, with a method as follows: If one were to drill a hole, in lengthwise position, into a cylindrical billet, this cannot be accomplished by a drill press, but only by a turning lathe, as otherwise the hole would not be located in the centre. It would further require a certain number of revolutions, which, in all cases, must be suitable to the material to be bored.

From the sketch herewith it will be seen why a hole can only be drilled lengthwise into a billet when the latter is rotating, and to have it located exactly in the centre line of the billet. Point A is located upon the outside circumference. B represents a point upon an inner circle lying concentrically toward the circumference. C lies upon a smaller inner circle, and this at the same time is to represent a hole to be drilled into the section of the billet.

By allowing the section to rotate around the centre point F, all points located with C upon the inner circle will have the same speed. It will at once be seen that all points located with B upon a circle farther away will have a higher speed than would points, with C upon the smaller circle. The drill, which is to bore the hole in the smaller circle, will not deviate from the centre, for if it did it would have to perform a greater task on account of the power of the material which holds the drill in the centre.

The manufacture of rolling tubes in the rolling mill represents a similar process, and the revolutions of the billets must be arranged for in sufficient number, and suitable for the material to be rolled, in order to obtain an even wall-thickness.

For this reason it has been impossible, to date, to construct a press that would, for instance, turn out seamless tubes with satisfactorily even wall-thickness, as it is difficult to construct a press in such manner as to allow the billet to rotate. Besides material of tubes, as produced by the presses, varies greatly in tensile strength and elongation, causing difficulties, particularly when redrawing, for which reason the tubes cannot be used for any and all purposes.

Seemingly it would be more economical to employ presses for the manufacture of seamless tubes, because the foundry turns out billets of one and the same dimension only, and from these billets the press would then produce all sizes of seamless tubes. The tube material turned out by presses, however, increases in hardness and grows worse in structure when the difference between diameter of the billet and tube to be produced increases, because the material in the press undergoes such great contraction.

IMPROVED REDRAWING METHODS OVER LONG MANDRELS

The usual method employed in the manufacture of seamless tube, such as are generally traded in here, is that the tubes are being drawn through a narrower die on the draw-benches, a plug being located in a certain position inside the die. The dimensions of die and plug are so figured that in decreasing the outside diameter of the tubes inside of die, in consequence of friction upon the inner plug, a thinner wall-thickness is obtained, and, simultaneously, the tube lengthened. This procedure is repeated with the same tube, which has previously been annealed and pickled, although a narrower die and smaller plug are used for each subsequent draw, and this is continued until the desired tube is finished.

To eliminate a large number of the aforementioned operations, a somewhat different method might be pursued. Instead of a short plug a long rod is used, which must be longer than the tube itself. This rod, with the tube, is being drawn through the die and the tube is drawn upon this rod.

Considerably less friction takes place in connection with this than there is with the first mentioned method, resulting in a thinner wall-thickness in less time, the tube also being finished very much more quickly.

The best possible results are obtained by using rods that have a particularly suitable surface, which may be obtained in various ways. The best surface is the one, that is evenly hard, having no soft or porous spot whatever, for otherwise, when drawing, the material of the tube would stick, in consequence of which the tube would break off. It would answer the purpose best to use ordinary carbon steel rods, having surfaces acquired by special process, as, for instance, chrome-nickel steel.

Extrusion of Brass

Answers to a Few Questions

Written for The Metal Industry by C. P. KARR, Exchange Editor

1. Will you give me information relative to the temperature at which leaded and non-leaded billets should be extruded, namely regular commercial rod 61% Cu, 2% lead and the 60-40 mixture?

2. Am I right in maintaining that the following should be extruded at a different temperature than either of the above—61 Cu 1½% lead and 1½% tin? Is this mixture suitable to cast in 2½-inch common mold for tube billets, or will they become too hard in drawing and break regardless of anneal?

3. Should leaded billet block material be left to cool of its own accord after removal from the muffle or be cooled with water and at what temperature should the material be?

4. Does the practice of leaving stubs of rods in the dies when extruding, materially affect the die, or metal from the billet following?

5. Will you kindly explain the reason of cores in extruded material?

6. Is brass rod especially troublesome to extrude as well as manganese bronze, especially in the larger sized rod?

7. It has been my observation that there is more trouble with cores in the two metals in the larger sizes than in other metals and I wonder whether the trouble lies in the heat of the billet before extrusion or the difficulty is in the casting shop by not getting the metal hot enough.

8. We use borax, salt and charcoal, the former being put in the furnace before the charge of scrap and other material, and when the charge is melted, as you know, it forms a film over the metal. Salt and charcoal are then thrown in the batch of metal and the spelter put in and the whole thoroughly stirred and skimmed, and after the making of a test bar, the furnace is closed and brought up to 1900 F. (1030 C.) for pouring.

A.—Your composition is too high in copper and it is better to omit the tin unless you must use it to harden your metal. The general opinion is that copper should run from 56 to 59%. It is claimed by some authorities that the best composition is 57% Cu to 1.75% Pb, balance zinc. Although the lead may run as high as 3% without segregation provided the mixture of the charge is properly made, and completely stirred before being being poured into billet form in an iron mold. The mold should be warmed before the molten metal enters it in order to avoid surface chilling, setting and cold shuts.

It has been shown by experiments that the outer skin of the billet becomes drawn into the interior of the bar, along the line of the flow. This phenomenon is to some extent responsible for the "piping" that sometimes occurs in the billet.

In your letter, in one place, you state that you pour your billets at a temperature of 1900 F. (1030 C.). This is altogether too high, because it causes a crystalline formation in the structure, when the structure should be rather "fibrous" and this may be obtained by extruding at a lower temperature. This extrusion temperature should range from 750 to 850 C. If much lead be present the lower temperature should be used.

Do not use aluminum as a deoxidizing agent, nor allow any of the metal to get into your charge; it may not be the only cause of the piping that occurs, but experiments have shown that its presence in the alloy is a contributory cause.

Do not use any scrap mixture in your charge if it can be avoided, but if necessary for commercial reasons, see to it that first, the scrap must be scrap from crop ends of extruded metal, or from crop ends of the billets. Make sure that the scrap itself is perfectly clean, free from oil, dirt, grit, sand or oxides. Second, have the scrap analyzed to learn what deterioration has taken place by the repeated meltings.

The extrusion process: Allow a clearance of 1/16 of an inch between the billet and container. Surface of billet must be kept clean. Piped head of billet should be cropped off. Reheating should be as brief as possible to avoid segregation of the lead contained in the billet. Runners on the hearth should be provided to prevent the billet picking up dirt or scoria of any kind. A moderately fair rate of extrusion is desirable. The time of extrusion for a 22-inch billet should be 25 seconds. A flat face on the die seating of the bolster should be maintained to avoid bowing of the die and its deformation. The square face of the die should have a radius of 0.062 at the aperture.

The heat treatment recommended is as follows: First, the billet may be heated to 825 C. in a gas furnace, quenched in oil and cooled in oil at 100 C. or, second, the billet may be heated to 825 C. in a salt bath, quenched in oil and cooled in a salt bath at 210 C. (straw color).

Although I know that small amounts of tin are used by some founders in their extruded metals because it is thought that it is of some utility in the heat treatment, but one reason against its introduction in an extrusion alloy is that the flow temperature of tin is from 180 to 217 C. with a flow pressure of 1.15 to 5.45 tons, and although tin increases the pliability and resilience of lead it also lowers the melting point of lead and might have a bad effect on the extruded metal in the cooling operation after quenching, particularly if cooled in a salt bath.

Your request about the method of cooling is answered in detail above. Do not leave any rod ends or particles of metal in the die, for the die must be kept clean. The die also should be kept heated during the process of extrusion so that the chilling of the extruded rod may not occur. Such chilling promotes a faster rate of flow of the hotter zones of metal at the center of the rod. If a piece of such a rod be heated and quenched in water the outside skin will pucker. This fact suggests a good preliminary test for you to make to find out whether you are using your die at too a low a temperature during the extrusion process. It is believed that this action is one of the principal causes of core formation that you are inquiring about. Another contributing cause is the phenomenon of segregation which is caused primarily by improper pouring temperature of the billet, and secondarily may be connected closely with the flow line of the metal in the vicinity of its quenching temperature.

Manganese brass (not bronze) may be extruded if the alloy is properly made and not poured at too high a temperature. Leaded billet block should be heat treated and cooled as above stated. There is generally more trouble with cores in rods of large diameter than in those of smaller diameter because in the larger rods the metal is hotter, holds its heat longer in the center, segregation of the lead is promoted and the flow line is not so uniform.

The charging methods have been outlined as above. Do not stir the molten metal with an iron rod, but use an Acheson graphite rod about two inches in diameter and twenty-four inches long, held in an iron socket attached to a piece of iron tubing so as not to make the stirrer awkward to handle.

New York Meeting, American Electroplaters

Some of the Discussion at the Technical Session Before the Banquet of the New York Branch

The technical program was as follows:

1. The Polishing and Plating of Die Castings, by Albert Pflomm.
2. Zinc Solutions.
   a. Zinc Cyanide versus Acid Solutions.
3. Current Densities and Voltages at which Plating Soliutions are Best Operated.
   a. Critical Review by Charles H. Proctor, of Frank A. Mason's paper on "A New Maximum Current Density in Commercial Silverplating," delivered before the Faraday Society.*
4. Importance of Anodes in the Plating Industry, by Buchanan.

DISCUSSIONS

The Polishing and Plating of Die-Castings.

Mr. Haas noted that the solution advocated by Mr. Pflomm contained a good deal of nickel. He asked the members present to give the results of their experience with such solutions stating, himself, that he had heard from various sources that nickel solutions for plating die castings should run from one ounce per gallon down. Mr. Pflomm answered that he kept his bath up to three ounces of nickel per gallon split between single and double salts.

Mr. Proctor stated that in the Middle West in the large plating plants of La Salle and Peru, they had obtained better results by using one ounce of nickel per gallon and less. He showed a sample die-casting plated with nickel in a solution which contained 8 ounces of single salts per gallon at about 80 to 100 degrees Fahr, in about 12 minutes. In La Salle and Peru they take about 4 minutes to plate their parts.

Mr. Voss asked Mr. Pflomm how long his work remained in solution and how it stood up under the buff. Mr. Pflomm answered that it was plated between 7 and 10 minutes, and stood buffing well.

Mr. Proctor gave it as his opinion that eventually platers would return to the chlorides for plating zinc, and that in spite of the difficulties which had caused the change from chlorides to sulphates, platers would eventually go back. This statement called forth considerable discussion.

Mr. Hogaboom said he believed the most important point had been overlooked. The element of prime importance was that there should be sufficient anode surface and that the type of solution was entirely secondary. To this Mr. Proctor and Mr. Madsen agreed.

Zinc Solutions.

(a) Zinc Cyanide versus Acid Solutions.

Under this topic there was no formal paper delivered, but simply general discussion.

Mr. Proctor stated that he believed cyanide to be preferable and gave the following solution as one which would work.

Sodium Cyanide	7 ozs.
Zinc Cyanide	8 ozs.
Sodium Sulphate	4 ozs.
Sodium Fluoride	1 oz.
Sodium Hydrate	½ oz.
Colloid such as Gum Arabic, Dextrine, etc.,	5 grains.
Water	1 gal.

Mr. Voss asked how this solution would deposit on cast iron, to which Mr. Proctor answered that it would not work.

*See THE METAL INDUSTRY, February, 1921, P. 76.

Mr. Hogaboom explained the difficulty in depositing on cast iron. It was due, he said, to crystal structure in the metal. Certain constituents were much better conductors of electricity than others, thus there was difficulty in plating. In cast iron the constituents present at the surface were Pearlite and Ferrite, the Ferrite being pure iron, and the Pearlite, an iron carbon compound. The pure iron Ferrite being a much better conductor was much more easily plated, but since the most of the material near the surface of cast iron was Pearlite it caused great difficulty.

Dr. Blum told of an interesting expedient by which Mr. Brockway of the Ford plant, got a good deposit of zinc. He simply put a little copper salts in his solution. Mr. Voss corroborated this evidence by stating that he had himself been able to deposit zinc on cast iron from a high zinc brass solution.

Dr. Blum was asked which colloids work better in acid or alkaline solutions. He replied that it was impossible to say broadly, which was the best. He, himself, thought glucose was excellent because it could be used in fairly large quantities, thus eliminating the risk of delicate handling. In general he believed that alkaline solutions threw metal into recesses better than the other; not because of its greater conductivity necessarily, but simply because of its throwing power.

Mr. Hogaboom added that most of the aeroplane work had to be plated in alkaline solutions, but one or two aeroplane parts were passed around, showing an excellent deposit which had been put on in an acid solution.

Current Densities and Voltages at Which Plating Solutions are best Operated.

Mr. Proctor read a paper which had been previously delivered before the Newark Branch, but which proved very interesting to all who were present, reviewing a paper by Frank A. Mason.* Mr. Proctor's paper can be found on p. 115 of this issue of THE METAL INDUSTRY.

Importance of Anodes in the Plating Industry.

This paper by Mr. Buchanan, who was at the time ill and unable to attend the meeting, had been procured by Mr. Haddow. In this paper it was stated that much more attention should be paid to the anodes in plating. Nickel anodes were of various shapes and ranged in composition from 85 to 97 per cent pure. The 85-87 per cent type were used for stove work, but now platers were coming more and more to use the purer anodes. It was stated that eventually they would use 95-97 per cent material.

Mr. Hogaboom made a motion that a vote of sympathy and a wish for his speedy recovery be transmitted to Mr. Buchanan. This motion was passed unanimously.

Mr. Hogaboom asked what was the relation between rolled anodes and cast anodes as regards their efficiency.

Mr. Haddow replied that the rolled anodes showed an anode efficiency of 83 per cent and a cathode efficiency of 50 per cent. The cast anodes showed an anode efficiency of 91 and a cathode efficiency of 93. According to these figures there was no excuse for using rolled anodes. Nevertheless according to Mr. Hogaboom and Mr. Madsen rolled anodes are being used in England. Mr. Madsen stated that cold rolled anodes could be made to give an efficiency of 99 per cent with plenty of chlorides in the solution but that it would be too expensive. He stated that among the most important things that the plater ought to know was a complete analysis of his anodes showing all their constituents.

Inert Salts in Plating Solution

What Is Their Maximum Efficiency and When Do They Become a Detriment?*

By CHARLES H. PROCTOR

The reprint of a "special" to business section, "Philadelphia Public Ledger," dated London, December 7, on page 7, January issue of the Monthly Review, no doubt created considerable interest to the members of the society, as the title read "New Process Speeds Electro-Plating." All progressive platers are very much interested in any innovation that will give them new light in their adopted profession and help them to become more efficient in their labors.

The reprint alluded to a paper that was read at a joint session of the Faraday Society and the Sheffield section of the Institute of Metals, held at Sheffield, England, on Friday, November 19, 1921, when a double session was held, one for the discussion of problems relating to electro-plating generally, and the other to the consideration of papers on silver plating.

Reducing Mr. Mason's contentions down to their basis, the reader will note that by the addition of approximately 24 ounces of potassium carbonate to a solution prepared from water, 1 gallon, metallic silver converted to silver cyanide, 3½ ounces and 6 ounces, potassium cyanide as free cyanide. The solution will give 100 per cent greater efficiency than a silver solution lower in free cyanide, and only a minimum of potassium carbonate added as a conducting medium.

Mr. Mason claims to have used a current density as high as 8 amperes per square foot of surface area, or cathode surface, and yet obtained a deposit of a soft nature with fine crystallization that would burnish or polish very readily.

All this information is very interesting, especially to platers who do no silver plating, and others who do not keep in touch with up-to-date methods, or who make no mental or written note of them. But to platers who do know or do keep in touch with the advancement made in the art of electro-plating, Mr. Mason's paper throws no new light upon high current densities in commercial silver plating as it will show later.

One very interesting statement of Mr. Mason's that is worthy of note, is his reference to the actions of colloids in various plating solutions, with the sole object of increasing the current density, and incidentally improving the deposit.

The question arises, is the current density increased at the cathode, or does the addition of a "colloid" require a greater "voltage" rather than a higher current density to produce a deposit of more uniform texture and finer crystallization?

Mr. Mason states further, "without entering deeply into this interesting subject of colloids and colloidal substances, mention might profitably be made here of the fact that enhanced knowledge of this branch of physical chemistry compels us to acknowledge, that colloids cannot be looked upon as comprising only a certain class of substances.

"The crystalloid, as well as other substances can, by suitable means, be converted into colloids; in fact, authorities on this subject agree that there is a state in which all substances can be converted so that they resemble colloids, and act as such.

"It has long been the opinion of the author that substances classed as crystalloids when present in silver plating solutions have an influence similar to that of a colloid."

The reference made by Mr. Mason to a "crystalloid" is more interesting to the American electro-plater than anything else in his paper, and should be taken note of by the authorities of the American Electro-Platers Society.

If potassium carbonate, or any other salt that we commonly term conducting salts become colloids and give the advantages claimed by Mr. Mason, then why on earth do we precipitate the carbonates, either sodium or potassium, out of our silver solutions when they become excessive (never as high as 24 ounces per gallon of solution), if they become colloids and give a greater maximum of efficiency than a solution that contains only a minimum amount. If inert salts to such a degree are valuable in a silver solution, then why not in any other solution that is made up from cyanides?

The use of barium cyanide to precipitate the carbonates out of silver solutions, and the "freezing" method advocated so freely by a well known member of the society is all wrong if Mr. Mason's contentions are correct.

As platers, we have been led to believe that conducting salts have a value up to a certain point, that cyanides after their cyanogen has been used up and they become carbonates are a detriment, when they become excessive they retard the metal in deposition and increase the resistance in solution, therefore requiring a greater pressure in volts to obtain the same results. We may be wrong. Solutions that use a lower pressure, that have the high metal content in solution and are low inert salts may not give the results we presume.

I want to point out some facts that have been written by a member of the American Electro-Platers Society and advanced at the St. Louis Convention in July, 1917, covering potassium carbonate in silver solutions and advocating a greater amount of free cyanide for higher efficiency silver solutions.

Mr. F. C. Mesle, of New York branch, was the author of a paper entitled, "Factors of Importance in Silver Plating." The paper can be found on page 10, September, 1917, issue of the Monthly Review issued by the American Electro-Platers Society.

It will be noted in this paper by Mr. Mesle that he can see no advantage in using more than 6 ounces of cyanide per gallon of solution, presumably free cyanide, there being very little difference in the nature of the deposit whether 6, 12 or 20 ounces are used. Hence cyanide used in excess of 6 ounces per gallon is not only wasteful, but actually produces an inferior deposit. Mr. Mason claims for his formula 47.25 grams per litre, approximately 6½ ounces per gallon.

Mr. Mesle further states: "Three solutions the same except for the cyanide were run in series to assure the same current density, one at 4½ ounces, 6½ and 8½ ounces per gallon" (samples were shown to the members present plated from the three solutions).

The 8½-ounce solution allowed about 10 per cent. more current than the 4½-ounce solution, yet the deposit was not as good, and will not finish up as well.

The 4½-ounce solution produced the best deposit at a C. D. of 45 amperes, and was still the brightest deposit at a C. D. of 60 amperes per square foot of cathode surface area, but the edges of the article became burnt, denoting an excess of current.

*A critical review of Frank A. Mason's paper in "A New Maximum Current Density in Commercial Silver Plating." See THE METAL INDUSTRY, February, 1921, p. 76.

I am unable to see where Mr. Mason's contentions come in that a solution with a current density as high as 8 amperes per square foot of cathode surface is a maximum current density solution. It has been inferred in several publications that it would practically revolutionize the present method of silver plating. Certainly not at 8 amperes, when an American electro-plater claims results that are commercially satisfactory at 45 amperes or even more. Mr. Mason so far has given us nothing new except the crystalloid-colloid theory.

The writer has always claimed that more amperes upon a given surface area means more metal proportionately in solution unless the current is being used up in the evolution of hydrogen.

Mr. Mesle, in further reference to current density, states that the amount of metal in solution is an important factor in determining the rapidity of deposition and the current density used.

If a solution containing 2 ounces of silver per gallon can be run at a C. D. of 10 amperes, then a solution with 4 ounces may be run at a C. D. of 20 amperes; in other words, the speed of any solution may be increased 100 per cent. by doubling the metal content of the solution and still do good work, providing, as stated above, that sufficient free cyanide is present to take up the silver at the anode as rapidly as required by the current used.

Up to this point, Mr. Mesle does not mention any other factor, except carbon disulphide. In a later paragraph he does refer to temperature which might become an important factor in the rapidity of deposition of silver, but, as far as I am able to ascertain, warm solutions are not used in the silver plating industry.

At a temperature of 72° F. a C. D. of 60 amperes produced a "burnt" deposit, while the same solution at 112° F. reached a C. D. of 100 amperes before it produced the "burnt" deposit.

Therefore, an increase in temperature of 60 per cent. will allow a 60 per cent. increase in C. D., or rapidity of deposit and still do good work.

These same solutions, presumably referring to the solutions used from which the samples submitted were produced, when run at a current density of 10-20 amperes produced a white, hard deposit, difficult to finish up in the regular way. (Why not use hot silver solutions?)

Later Mr. Mesle refers to potassium carbonate as follows: "This material is also an important factor. It is a common opinion that a pure silver solution (i. e., having only silver and cyanide) is most efficient. Even if this were true, it would be extremely difficult, if not impossible, to use a silver solution and not have it gain in carbonate due to the decomposition of the cyanide under electrolysis."

It is the consensus of opinion of most platers that a new solution does not work as well as an old one (one that has aged). Is this not due to the fact that the old solution has acquired carbonates, etc.?

A solution having no carbonates may do good work, say at a C. D. of 20 amperes, but if from 8 to 12 ounces of potassium carbonate are added the C. D. may be increased more than 100 per cent. and still the solution will give a good uniform deposit, but more than this amount of carbonate in solution is no advantage, but detrimental.

In fact, when 16 ounces are used it begins to add to the resistance of the bath, if a maximum of 24 ounces is used the resistance is increased 200 per cent., with no apparent change in the deposit. Langbein, in one of his early editions, states that if more than six grains per liter (about 0.8 ounces per gallon) accumulates in the bath it must be removed by adding barium or calcium cyanide. If Langbein is right then Mason must be wrong.

Certainly American platers can learn nothing from Mr. Mason's paper, in view of the facts that had already been incorporated by Mesle in his paper.

A Few Facts From the Foreman Plater

Written for The Metal Industry by H. LOUNDES, Foreman Plater

Having had a good many years' experience in plating, it has often occurred to me that it is hard for the old time plater to break away from the old way of plating. Even to-day you will find in a good many places the rectangular tub with the straight pole down the center, with its one dozen and one connections; old banjo wire, Rheostat, no agitation, or if agitation, up and down, and no meter. The up-to-date plater will have, whether it is for flatware or hollow ware, a rectangular tub in multiple, with a Sangamo meter, ampere meter, with connections on each tub and strike, with volt meter on dynamo to exclude the possibility of burnt work, with a Rheostat with which you can reach almost any point.

The reason a rectangular tub in multiple gives better results and more uniform plating than a tub with a straight pole down the center, is that in a tub with straight pole the anodes are down the two sides of the tub, and therefore the back of the anodes that face the side of the tub do not get any action on it. In the tubs that are in multiple, the anodes are working both sides, which means more plating service, more anode service, more amperes, less time in plating. The fact of being able to do more in multiple must mean quite a saving, not having so much silver and cyanide tied up in solution. To get good results the agitation should be lengthways at least one inch, the more agitation the more amperes.

Another peculiar thing about plating is that the plater gets blamed for almost everything that happens to a piece of work going through the mill. For instance, if the Boss Polisher gets a lot of "cut through" he blames the plater for not putting on enough plate, and when it has been proved to him that he is in the wrong he will have another excuse that the burnisher puts too much tension on his machines, causing lines, and in digging the lines out cuts through. When the burnisher is tackled he will say it is in the metal, and after proving to him he is in the wrong, he will deny any such thing.

If the polisher will only use a smaller wheel to bowl out and watch his green help a little more he would have less cut through. About flatware that has been stripped, due to defects in metal, many a time the Boss Sand Bobber will put his greenest help on it, and the consequence is he goes all over it and does not take out the cause for which it was rejected, and it goes around and around. I claim that the best man he has in the room is none too good for that job. The same with soft metal and nickel hollow ware. If the Sand Bobber does not make a good job of his end of the work all imperfections show up after plating, and it is impossible to put a good finish on a piece of goods if it is not properly finished, or when the work is done incorrectly the first time. It only increases the cost of production which every foreman plater is trying to cut down.

Now a good deal of this, if read by a polisher, burnisher or Sand Bobber, he will say is just getting even. Maybe it is, but it is straight facts, just the same.

Electro-Deposition as a Repairing Process

Remarkable Experiences in European War Workshops—Part I

Written for The Metal Industry by our British Correspondent

At the December meeting of the Birmingham (Eng.) local section of the Institute of Metals, a paper was given by Mr. W. R. Barclay,* O. B. E., A. M. I. E. E., entitled, "Some War Experiences in the Electro-Deposition of Metals." Mr. Barclay is at present managing director of the famous metal firm of Henry Wiggin & Co., Ltd., Birmingham. During the war he held important positions under the Ministry of Munitions as an expert adviser and controller. The paper read in part as follows:

Toward the Autumn of 1917 I was informed that several of the workshops of the R. F. C. and the R. A. S. C. were carrying out experiments in the electro-deposition of metals with the object of building up worn parts of machinery for re-use in cases where replacements were difficult to obtain. This problem of replacements was particularly acute in view of the enormous increase in the demand for new material. The munition works at home filled with huge orders for new aeroplane engines, new guns, new motor vehicles of every possible description had little time to give to the supply of spare parts; and large quantities of war material were constantly being sent into the workshops of the various army bases for repairs, which could not be sent back into service without such new parts. Under these circumstances, therefore, it was essential that every avenue should be explored which held out possibilities of re-using old or rejected parts, many of which were thrown out of service for a worn section, only 3 or 4 thousandths of an inch below standard, often even less.

The excellent idea occurred to the army engineers to endeavor, by means of electro-deposition, to build up a metallic deposit on such sections, regrind or machine them to standard size, and so re-fit them for use. The idea was obviously feasible, and experiments were started in the first instance, I believe, in the workshops of the Flying Corps, where the needs were exceedingly acute. The possibilities, however, were almost equally quickly grasped by the A. S. C. engineers; and experimental work in their workshops was also commenced.

It was not until the work had been in hand for some little time, that I became interested in it. My first intimation of it came through an officer of the staff of the Director-General of Transport in France, and took the form of a question as to which metal held out greater promise of satisfactory results for such purposes. I was informed that experiments had been started on deposits of nickel, iron and copper, and it was particularly desired to ascertain what possibilities lay in the use of alloys, of these or similar metals. I gave what assistance and advice I could by correspondence, and I had several interviews with staff officers in London, but finally the Assistant Director of Transport at G. H. Q. requested through the War Office that I should be sent over to France to visit the shops and advise on the spot.

I must at this point pay a tribute to the officers of the A. S. C. with whom I came into contact. They were exceptionally keen and able men, and particularly was this the case at St. Omer.

It was a gratifying experience for me to find that one or two officers with no previous knowledge of the subject whatever, and very few workmen of an appreciable standard, had been able to put down a plant and contrive and invent apparatus for the electro-deposition of iron, which would compare very favorably indeed with plants supplied and erected by trade firms. Very considerable ingenuity had been displayed not only in erecting plant, but in making special fixtures and fittings for the very awkward types of work which required treatment. As I have indicated the main needs of the department were iron deposits or deposits of similar metals for "building up" purposes, and when I arrived at St. Omer a plant was already at work and sufficient experience acquired to indicate the main difficulties which were likely to be encountered. These difficulties may briefly be summarized under two headings:

(a) Preparation of Parts for Treatment.
(b) Management of Electrolytic Solutions.

(a) presented problems of quite an unusual order. (b) on the other hand gave rise only to those difficulties inherent in all attempts to deposit smooth, adherent, coatings of electrolytic iron.

The difficulties of preparation of parts arose mainly owing to the peculiar requirements of the work. The great majority of pieces sent into the shops for treatment were unequally worn often only over a relatively small portion of the entire surface. Gudgeon pins, for example, would be worn to the extent of 2 or 3 thousandths of an inch, only for an inch or two of their surface. Crank shafts would similarly of course be worn where fitted into bearings and so on. But the most awkward factor of all, probably, was that many of the parts were far too big to be immersed in a depositing vat in view of the very small portion of their surface actually needing treatment. In many cases, therefore, instead of the article going into the vat, the vat had to be literally built around the article, and a number of ingenious devices were contrived from time to time to meet special cases.

Even when it was feasible to use a large depositing vat of a conventional type, it was necessary to resort to "stopping-off" compositions to prevent the deposit going on where not required, and anyone who has had experience of stopping-off compositions will know how very greatly they complicate the difficulty of preparing a surface for an electro-metallic deposit. I gave all the assistance I could to the workers at St. Omer, but many of the points raised demanded some degree of experimental work, which had to be held over until my return to England.

My next visit was to the 4th Heavy Repair Shop at Rouen, where much the same kind of problems awaited me, though under somewhat different conditions.

I think at this late stage, when the War is quickly passing into history, it is permissible to say that the 4th Heavy Repair Shop at Rouen was almost entirely staffed by German prisoners. When I was there they numbered about 3,000, and I think all told there were considerably less than 50 British Officers, N. C. officers or men in charge.

The depositing shop was not quite so far advanced as the 3rd Shop at St. Omer, but some part of the plant and apparatus had been put down and was being worked by about half-a-dozen of the prisoners under an English non-commissioned officer, who had had some little electroplating experience. I got into conversation with one of the workmen, who was at work preparing parts for treatment, and was surprised at the knowledge of chemistry he displayed. Indeed he was for a while something of a

*Co-author of Electro-plating by Barclay and Hainsworth.

"mystery man," but the secret of his knowledge was revealed when I found that he had been a professor of chemistry in one of the German provincial technical colleges. I think he was quite happy to have found such congenial work.

At Rouen, as at St. Omer, I examined in considerable detail the particular work needing treatment and the difficulties encountered, which though varying in type, as I have said, were in principle the same.

I then paid a series of visits (which I must pass over very briefly) to the Army Depots to inspect the stores both of new parts, and those taken out of service to enable me to visualize the nature of the problems facing Repair Depots as a whole. It is indeed difficult for those who have not actually seen such stores to realize what it meant in those early days of 1918, when every fibre of the British army was being stiffened to meet the threatened big push of the Germans to keep 30,000 to 35,000 motor vehicles, varying from huge 5 to 10 ton Lorries, the Rolls-Royce and Daimler cars of Generals and staff officers, down to the humble motorcycle of the despatch riders, all in such a state of high-grade efficiency as modern war demands.

I also visited the extremely efficient and well-managed Repair Depot of the R. F. C. at Pont de l'Arche, where more practical experience in the detail of iron depositing had been gained than in the A. S. C. Shops. I think indeed that the R. F. C. Engineers deserve the credit of being the earliest in the field to realize the possibilities of this process.

Finally I wound up my tour at Paris where I investigated the position at the First Repair Shop. Altogether I covered over 750 miles in my journeys, and passed behind all the British and part of the French lines in North France.

I think at this stage I can best summarize the results and impressions of my visit by quoting from my report made subsequently to the Director of Transport of the British armies in France.

"I pointed out that this class of work presented problems not unusually met with in ordinary electro-plating processes e. g. The ordinary electro-depositing vats and equipment were useless owing to the fact that the surface requiring deposition was very small compared with the size of the piece as a whole. This means that practically separate vats and anodes must be built and arranged round each part.

Again, while the technical literature of electrolytic iron was fairly extensive, little work had been done on suitable electrolytes for producing thick, smooth adherent deposits at normal room temperatures. Also the extensive use of stopping-off compositions necessary in dealing with the work greatly complicated the general cleaning and preparatory processes.

Viewing the whole matter broadly, I said, the position was this: "Here were a number of men working under most difficult conditions in a direction in which practically there is no previous experience to guide them."

Writing generally, the art of electro-deposition of metals has been applied in the past:

(1) To the obtaining of refined products from impure metals. (Electrolytic refining.)

(2) To the production of protective or ornamental metallic coatings. (Electro-plating.)

And though considerable technical literature and experience is available in both these branches, these do not bear immediately on the needs of the Army Repair Depots.

Here follow examples of the kind of questions put to me in France:

(1) What degree of adhesion is it possible to obtain in building up these worn parts?

(2) Is iron the best metal for depositing for the purposes in view?

(3) Are we using the best solutions and processes for iron deposition?

(4) Can we deposit an alloy of iron and nickel?

(5) To what thickness can we safely go, bearing in mind the necessity for smoothness, and soundness of deposit, and above all adhesion.

In this report I finally pointed out that speaking generally there was in these army shops a serious lack of these apparently insignificant conveniences which make all the difference sometimes to the quality and efficiency of output.

The officers in charge also lacked that confidence in their work, which can only come from technical mastery of the processes and faith in the results. Their work was so novel to them that, in spite of a measure of success, they were inclined to exaggerate difficulties and to doubt their ability to solve them.

With these impressions strongly in my mind, and a fairly clear visual conception of the general position and magnitude of the problem, I returned to England, with the conviction that a good deal of hard work awaited us at home.

The result of my representations to the authorities of the War Office and Ministry of Munitions was the formation in April, 1918, of the Electro-Metallurgical Committee of the Ministry of Munitions under the Chairmanship of Sir Henry Gould Adams, who was for some time Superintendent of the M. I. D. of the Ministry.

Under this committee, on which I served as technical director, the Electro-Metallurgical Laboratory of the University of Sheffield, and one of the laboratories of the Northampton Polytechnic Institute in London were taken over for research work, and a simple, but so far as it went efficient organization was set up with the object, (A) of dealing with all technical problems submitted from the workshops in the field, and (B) of instituting new research work on lines suggested in my report.

Unfortunately there were a number of unavoidable delays (as indeed there always is in getting a new department at work), but by May investigations had been actually begun at Sheffield and a preliminary report was presented to the committee early in June.

This report concentrated attention on iron deposition as holding out much greater promise of usefulness than either nickel or any other available metal.

Passing over much detailed work, I must now attempt to give you, as clearly as I am able, a summary of the research work carried out under the committee during the middle of 1918, particularly on the electro-deposition of iron.

It was sought to determine *inter alia*.

(A) The qualities of various electrolytes, recommended by authorities or suggested in other ways.

(B) The influence of "metal" and "free acid" concentration.

(C) Anode and cathode efficiencies.

(D) The influence of current density and temperature.

A very large number of experiments were carried out in the University of Sheffield, and to my colleague there, Lieut. W. A. Macfadyen, B. A., is due very considerable credit for what success attended these investigations.

Fortunately a paper by Mr. Macfadyen has recently been published in the transactions of the Faraday Society, and it is therefore unnecessary for me to enter into great detail. Some important results may, however, be emphasized.

First, with regard to the electrolyte. Early in our experience, both at home and in the field, the value of ferrous ammonium sulphate as electrolyte was recognized, and, although a number of other solutions were tried under varying conditions, this was adopted as a standard electrolyte. It should be said, however, that our range of choice was very appreciably limited by the necessity of working cold solutions. The experimental work was, therefore, speedily directed into ascertaining the best composition as to metal and free acid concentration.

The composition of electrolyte ultimately decided upon was as shown:

350 grams ferrous ammonium sulphate + 5/1000 N. sulphuric acid, i.e., .1486 ccs. per litre.

The importance of maintaining both at this standard cannot be over emphasized, and it is specially a factor that the free acid content shall not be exceeded.

This solution will work very satisfactorily indeed at room temperatures with an E. M. F. of not more than 2 volts between electrodes and a current density of from 15-23 amperes per square foot.

Samples of deposits are here for exhibition. The deposit is smooth, of a good color, and granted, of course, thorough preparation of surface to receive the deposit, it is perfectly adherent.

The cathode efficiency is also very high indeed, ranging from 90 to as high as 98 per cent.

It is necessary to emphasize the importance of C. D., the figures given being minimum and maximum for the conditions of electrolyte and temperature named.

A serious source of trouble was found also in any variation of the acid concentration.

If the bath is exactly neutral it rapidly becomes dirty and the deposit is pitted. On the other hand, any excess acid over the limited margin given renders the deposit darker in color and very brittle, so much so as to crack and peel by the simple action of the heat of the hand.

While our first aim was to establish conditions suitable to working at normal temperatures, the possibilities of heated electrolytes were by no means ignored, and a large number of experiments were made with higher metal concentration and higher temperatures. These showed that where such conditions could be employed very considerable increases in current density, and therefore the rate of working were possible. In some experiments C. D. up to nearly 400 amperes per sq. foot were successfully employed.

I must now refer to a further development of the process which was, and is, of great interest to engineers. Amongst the questions put before me in France was that of the possibility of case hardening these deposits. I felt at first that this was making a very considerable demand on the adhesive qualities of the deposits, but it was decided to institute experiments.

I think the result of these, which were carried on both in France and at home can be fairly described as exceedingly successful.

Time will not permit me to refer in detail to the other experimental work of the E. M. committee, but I must make mention of the fact that while the investigations into electrolytic iron were proceeding in Sheffield, other experimental work was carried out in London by Lieut. W. E. Hughes, B. A., who tested the possibilities of other metals, such as cobalt and nickel.

In addition to research work along the lines of a definite programme, we also attempted, through the committee, to extend the area of usefulness of electro-deposition processes in general, and in this respect received much assistance and valuable suggestions from the Air Board.

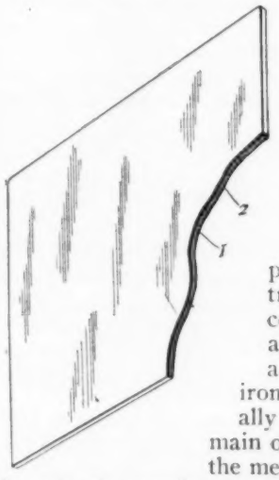
I must now record the very interesting fact that some months after the E. M. committee had been organized we were informed that the American Army authorities had, quite independently and without having any knowledge of our plans, formed a closely analogous body of working under the Bureau of Standards at Washington. This body included, in addition to members of the Scientific Staff of the Bureau, officials of the Army Ordnance Dept. and a number of expert representatives of the electroplating industries, and was intended to act as a research and advisory committee. This committee communicated with us in October, 1918, suggesting an exchange of reports and experiences. A suggestion which we very cordially accepted.

We found, however, that the American committee was dealing more particularly with electro-plating processes as protective agents against corrosion, so that we were not able to compare experiences on the same lines. Still the American reports were very interesting, and furnished useful information on the subjects of lead and zinc plating and testing of deposits of these metals. I hope you will therefore allow me a brief reference to their work.

This article will be concluded in our April issue.—Ed.

EDISON'S ELECTROPLATING PATENT

Mr. Thomas A. Edison, one of the most valued subscribers to THE METAL INDUSTRY, has taken out a patent (No. 1,359,972, Nov. 23, 1920) on electroplating. The particular thing patented is a method of preparing the metal so that the plate can be easily stripped. The specification reads in part as follows: "When a metal is plated electrolytically directly upon another or the same metal, it is usually very difficult to separate, remove or strip the metal which is plated from the metal plated upon. This is especially true in the case of either nickel, copper or iron plated electrolytically on any of a number of metals, including copper, nickel and iron. As a matter of fact, generally in electroplating, one of the main objects to be attained is to cause the metal which is plated to firmly adhere to the member plated upon.



The principal object of my invention, however, is to enable a metal electroplated on a metal to be readily stripped or removed therefrom, or in other words, to prevent the metal plated from strongly adhering to the metal plated upon.

I have discovered that when a metallic member is properly treated so as to provide the same with a thin surface layer or film of a substance containing selenium or comprising a compound of selenium, such as a selenid, a metal electrolytically plated on the member so treated may be easily stripped therefrom without danger of injuring or defacing the opposed surfaces of said member and metal, no matter how delicately they may be figured or designed; and in general, my invention resides in a metallic member adapted to be electroplated with metal and having a surface layer or film of this character, and also in the process of providing the metallic member to be plated with such a layer or film."

The Future Relations of Capital and Labor

By WILLIAM H. TAFT, Ex-President of the United States

On Sunday, February 27th, at the Brooklyn Academy of Music, William H. Taft, ex-president, and in recent years a member of the War Labor Board, delivered a long and interesting address on the Future Relations of Capital and Labor. As the subject is of vital interest to all employers and employees of the metal industries as well as all other branches of industry, we are pleased to print an abstract of Mr. Taft's remarks. He said in part as follows:

Because power is abused is no reason that it should not be usefully exercised. A single laborer is helpless in dealing with his employer, because he must live on what he earns. He has no reserve capital to live on and support his family. If he would deal on a level of equality with his employer, he must unite with his fellows, in order that the result which is reached shall represent the play of equal forces, one against another.

"As to collective bargaining, I think it is perhaps the most important step beyond the formation of labor unions for the just solution of labor difficulties. It is not a panacea. There is no possible proposal that will be a cure for labor controversy.

"What is the controversy between Labor and Capital? It is a question of the disposition of the joint product of the union. When we have something to be divided between us, you cannot figure it out in any way that my interest is not adverse to yours. The interests of the working man and the capitalist will always be diverse in that respect. The question of division will always create an attitude of discussion, and what we must look for is machinery which shall make that discussion as feasible as possible.

"I have had several illustrations of what can be done in bringing men together. I will tell you of my experience in the National War Labor Board." Mr. Taft then outlined the operations of the War Labor Board and the difficulties met at its early meetings, when neither side would make concessions to the other. He told of an incident in which one of the manufacturers, disgusted at the lack of progress being made, said: "They have nothing but five manufacturers and five labor union heads, one advocate of labor, and what have they for the last member—nothing but a d—— Judge."

Regarding the subsequent operations of the board, Mr. Taft said: "That satisfies me what can be done if you get together and have conferences behind closed doors and not have every remark headlined in the newspapers. It convinces me of the efficacy of collective bargaining, and that the parties did not understand each other."

THE OPEN SHOP

"I want to deal with the open shop," he continued. "What is it? It is a shop where the men can work and are not excluded from work whether they belong to a union or not, where there is no discrimination against them or in their favor because they do or do not belong to a union.

"Each man is a unit. Each man is entitled to withhold his labor if he chooses. If there are union men who want a union representative, they should have him. If there are non-union men who wish to speak, they should be given the opportunity.

"What is the closed shop? It is a shop in which the employer agrees with the union men that he will not employ any non-union men. They are in a position in which they will withdraw if he employs a single non-union man. I think I would be a union man if I were a laborer, but I think the right of the men as to whether they join a union or not should be within their own discretion. They should not have to do what they would not do if left free agents.

"On the other hand, I consider a closed shop a shop in which the employer makes a contract with every one of his employees that he shall not join a union and in which he discharges any man who does join. That is a closed non-union shop. I am sorry to say that some gentlemen confuse open shop with closed non-union shop. We ought to have the issue clear.

"As to labor unions, there is one definition I attempted to make. Is it a labor union or a soviet? In our society we are all interdependent. We are so closely united that we must work together or we will die separately. If the farmers struck, if the cows struck, if the hens struck, we would be in bad shape. If a body of men whose work is indispensable in the discharge of one of those functions on which the community depends as a whole, says: 'If we don't get Government action of some sort, we are going to starve the community,' when the question should be determined by the voters under the Constitution, that body is making itself a soviet and is introducing Bolshevism into our country. If the community cannot protect itself against a conspiracy on the part of a small part of itself which attempts to starve it, it ought to go out of the business of being a community.

"During the war, I want to commend the labor unions as a whole. They had a great opportunity, as class consciousness of labor was enhanced all over the world because of the fact that wars are fought, not alone in the field, but quite as much in the factories and on the farm, in the mines and on the railroads.

LABOR AFTER THE ARMISTICE

"When the Armistice came, however, the bars were laid down. The labor union organizations became demoralized. We had strike after strike, and the men refused to follow their own leaders.

"We have reached a different situation from that prevailing after the Armistice was signed. The demand for labor is not so great, business conditions are not so good, prices are falling. Wages show a downward tendency. Labor unions are not so prosperous. When there is unemployment, they lose members and are weakened.

"At this time, there are employers who think it is the time to down labor unions. I contest their position. You can't down labor unionism and you ought not to down it. The hope of the country and its progress is based on the reasonable settlement of disputes by liberal employers and conservative labor unionists. There are Bourbons among the employers as there are extremists among Labor, who think that an open shop is an exclusive non-union shop. They are very unwise, and it will be apparent the moment we have the return of prosperity. It is not just as expedient.

"This labor question," he said in conclusion, "is most important in our progress. It must be fully discussed and the more discussion the better. Injunctions will never solve the question. They prevent the violation of legal rights, but legal rights are only narrow views of social rights. There is a zone of social obligations away beyond legal rights. A man who acts only on legal rights is a pretty poor specimen of humanity, and he does not get any pleasure out of life.

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EDITORIAL

THE COPPER SITUATION

The copper situation of to-day is one of deep interest and causes real concern to those engaged in its production and manufacture. Before the war copper kept fairly steadily along the even tenor of good production for normal uses. A large part of it was exported, and these exports were growing consistently. The war, however, forced an inordinately large part of the metal into munitions. With this, of course, came an augmented demand from the other users and the price rose.

Although at the time it seemed to be a very profitable condition for those engaged in handling copper, eventually it proved a boomerang. With the rising price came an effort to avoid using it. Moreover, Germany, one of the most important users of our copper, learned of necessity to get along without it. A large part of their shortage was made up by the reclamation of scrap copper to a degree that had been previously unheard of, and, wherever possible, substitutes were used.

At the time this did not affect the production in this country because the demands of munitions were always greater than the supply. Now, however, although the munitions demand is very small, the knowledge of substitutes that was gained during the time when they had to be used, has not been forgotten. It has been stated on good authority that much less brass is used in the building industry at present than several years ago. For utensils aluminum has made very serious inroads, and seems to be growing more and more popular. In the automobile industry copper is avoided wherever possible to save expense, but it may be that this will not continue, since it seems to be growing upon the trade that more substitutes for copper and copper alloys result in decreased durability and increased repairs. Nevertheless, the tendency is still to cut costs wherever possible, and so long as this exists, copper, being one of the most expensive of metals, will suffer.

The export situation in general is not particularly good. Germany still finds it necessary to use as little as possible, and will probably continue along such lines for some time to come. Eventually, however, conditions should return to their former state, or nearly so. The electricification of railroads, which seems to be gaining steadily, offers a tremendous outlet for the metal, and the fact that users are gradually realizing that substitutes for copper are only substitutes, and do not do their work satisfactorily, will bring the industry to its former position.

INDUSTRIAL ENGINEERING

A number of years ago the industrial world was swept by a new system—almost a cult. The system was based on "efficiency," an off-shoot of the scientific management idea. Within a short time the country was overwhelmed with "efficiency experts" who were willing, even anxious, to reorganize every business and factory in existence. Based on the publicity given to the work of a few pioneers, they declared themselves able to bring in business to the point where two dollars would grow where only one grew before.

After a few years these experts experted themselves out of existence. It took a comparatively short time to find them out, and the very name "efficiency engineer" came into disrepute. Now the name is very seldom heard and never advertised. The place of the efficiency engineer has been taken by the industrial engineer. This work is equally hard to define and equally susceptible of perversion. In addition, a branch of this profession, personnel management, has risen in much the same way as the efficiency profession. Likewise it will go through the same steps of deflation.

Unquestionably these industries represent real fields of endeavor. There is a place in the industrial scheme for efficiency experts and personnel experts. However, these professions lend themselves so easily to popularization, they are so very easy to talk about at great length without saying anything in particular, that there are still many would-be experts and quacks. They are fields which appeal strongly to young men who have soaring ideas and ideals, with very little, if any, sound experience, upon which to base them.

One can easily understand the attitude of the engineer who deals with "things" in the old sense of the word, that is, with actual materials of construction and operation, toward these new off-shoots. The first impulse of the man whose business is laying out plants so that they will work, and who thinks in terms of steel, concrete, coal, copper, or in other material objects, is to say that the term engineer as applied to these people is a misnomer. He discounts the titles, "personnel engineers," "sales engineer," "accounting engineer," etc. These people are to him personnel men, salesmen and accountants, worthy enough, it is true, but not engineers.

Before industrial engineering and its allied branches take the place which they should have, they will have to be standardized and stabilized. Work of this sort, to be done well, demands men of the very highest type, who must have strong foundations and wide experience, of which a considerable part should be actual work. Undoubtedly these professions will, and in the case of a few shining examples, have reached the first rank, but considerable development must be done, and numberless quacks weeded out.

A MISTAKE

In the Monthly Review for February, 1921, is an announcement concerning a referendum vote taken by the American Electroplaters' Society, which states that the amendment to the constitution to admit assistant foremen platers as associate members was voted down by a count of 348 to 183.

With the interests of the A. E. S. at heart and every wish for the success of the Society, we can only say that we believe this action to be a serious mistake. There is no question of the right of the majority to manage their own Society as they see fit, but it seems as though they should realize that the growth and strength of the Society will be helped, not by restricting it to a few of the best, but by educating as many as possible. Eventually older members must retire, and new hands and shoulders must take up the work. To be sure, a certain amount of new blood will come from the ranks of those who have already attained the position of foremen platers, but this will be very much more difficult than if the education of the platers had been begun while they were young.

The greatest difficulty in educating people to new and better ways is that they are set in the old, and unwilling or unable to change. The A. E. S. will be a much more active and progressive Society within the next ten years. if young men are trained to go into it. They would be taken in as junior or associates, and have the goal of full membership always before them. Instead of being forced to go out to get members, the Society would simply pass in judgment over those who applied.

We do not believe that this decision will stand for long. Sooner or later the members of the Society will realize that they have made a mistake and blocked one of its avenues to advancement. Eventually the more far-sighted policy will be followed.

NEW BOOKS

Dictionary of Chemical Terms, by James F. Couch, chemist Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C. Published by the D. Van Nostrand Company, 8 Warren street, New York. Size, 4¾ x 6¾, 204 pages. Price, payable in advance, $2.50. For sale by THE METAL INDUSTRY.

This book is one of the sort which has been found most useful not only to students but to chemists and metallurgists. Often the definition of a word makes all the difference betwen a clear understanding and a blank. Very few men have the whole chemical vocabulary at their finger-tips, and within the last few years the chemical activities and industries have broadened into so many and diversified lines that it has become almost an impossibility for the chemist to keep up with more than a small part of this literature. It is often necessary for a chemist to read into fields other than his own specialty. In order to do this intelligently, he must be able to know the exact definition of every word which he reads, and even in well appointed libraries, this has become increasingly difficult to obtain. The Chemical Dictionary solves this problem so easily and quickly that it has become a necessity for the well informed chemist or metallurgist to have at hand such a volume as this.

Selenium Cells and How They Are Made. Compiled and arranged by Samuel Wein, formerly Editor of Perfumery Art and Managing Editor of Color Trade Journal. Price $1.00.

This booklet contains a chronological survey of the most valuable information concerning selenium and selenium cell construction. It was written expressly for the experimentalist. The data given is of a practical nature, omitting mathematical and complex theories.

GOVERNMENT PUBLICATIONS

Gems and Precious Stones in 1919.—By B. H. Stoddard, U. S. Geological Survey, Washington, D. C.

Foreign Graphite in 1919.—By Arthur H. Redfield, U. S. Geological Survey, Washington, D. C.

Mineral Waters in 1919.—By Arthur J. Ellis, U. S. Geological Survey, Washington, D. C.

Chromite in 1919.—By J. S. Diller, U. S. Geological Survey, Washington, D. C.

Secondary Metals in 1919.—By J. P. Dunlop, U. S. Geological Survey, Washington, D. C.

Mineral Production of British India in 1918 and 1919.—Compiled by the U. S. Geological Survey, Washington, D. C.

National Safety Code for the Protection of the Heads and Eyes of Industrial Workers.—Handbook No. 2, issued by the Bureau of Standards, Washington, D. C. It gives a set of rules designed to give mechanical and optical protection to the eyes of workers in certain occupations which involve eye hazard. The rules have been worked up in co-operation with outside conferees representing all points of view and especially with the assistance of an advisory committee which has approved the draft of the rules. The rules are accompanied by a discussion intended to assist in their interpretation and application and to show the reasons for including some of them in the text.

TECHNICAL & SCIENTIFIC LITERATURE

THE ELECTROLYTIC REFINING OF TIN

Abstract of a Paper Presented at the Thirty-eighth General Meeting of the American Electrochemical Society, held in Cleveland, September 30 to October 2, 1920. By EDWARD F. KERN.

No Addition Agents Present: The best cathode deposits which were formed in electrolytes, which contained no addition agents, were those from stannous sulphate solution containing 6 g. tin and 7 g. of sulphuric acid per 100 c.c. (Solution *Dc*). The deposits formed in stannous naphthalene-sulphonate electrolytes (Solution *Cb*), which was made by replacing copper by tin, were second best; and the deposits from stannous-sodium chloride electrolyte (Solution *A*) and from stannous fluoborate electrolyte (Solution *B*) were third best. In no case were adherent, smooth cathode deposits formed, with no addition agent present.

All of the electrolytes except stannous sulphate containing 2.5 g. free sulphuric acid per 100 c.c. (Solution *Da*) remained clear on standing; this solution became turbid, and after several days a white precipitate settled out.

As the cathode deposits formed from stannous naphthalene-sulphonate electrolyte, solution *Ca* (which was prepared by electrolysis), were less satisfactory than those formed from the stannous naphthalene-sulphonate electrolyte, solution *Cb* (which was made from the corresponding copper solution by replacement with tin), solution *Ca* was omitted from the tests which were run with the presence of addition agents.

Addition Agents Present: In order to produce satisfactory cathode deposits of tin in the electrolytic refining of tin, it seems to be necessary to add suitable addition agents to the electrolyte. In the tests which are reported in Tables I to VIII, inclusive, it was found that the presence of peptone and of gelatine were beneficial; the presence of aloin was beneficial only with the fluoborate electrolytes when present in proportion of 1 g. per 1,000 c.c. solution. The most satisfactory cathode deposits were formed in the stannous fluoborate and in the stannous sulphate electrolytes when gelatine or peptone were present in the proportion of 1 g. per 500 to 1,000 c.c. of electrolyte. In the case of the sulphate electrolyte the best cathode deposits were formed when the solutions contained 5 or 7 g. free H_2SO_4 per 100 c.c. more than 2.5 g. free H_2SO_4 per 100 c.c. solution seems to be necessary. The presence of free acid over 2.5 g. per 100 c.c. keeps the solution clear, and prevents the precipitation of basic salts, which, if allowed to collect on the cathode deposit, causes the tin to form non-adherent and as large crystals. The cathode deposits formed from the stannous sulphate electrolyte containing 5 and 7 g. free H_2SO_4 per 100 c.c. were as satisfactory as those formed from stannous fluoborate electrolyte.

When dilute aqueous solutions of addition agents were added to the electrolytes, slight turbidity resulted, with exception of the fluoborate and the naphthalene-sulphonate electrolytes. The greatest turbidity formed in the chloride electrolyte and in the sulphate electrolyte containing 2.5 g. free H_2SO_4 per 100 c.c.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

THE ALUMINUM INDUSTRY

In our last issue (February, 1921) we published a letter from Mr. Lawrence Brile, of Brile & Ratner, Inc., which stated in its first paragraph "However, it is obvious to those who read this annual article just who causes its publication."

We take this opportunity to say that Mr. Brile is under a slight misapprehension. Neither Aluminum Man nor the company in back of him "causes its publication." The articles have always come at OUR request—sometimes made repeatedly before it is satisfied. The Metal Industry is an absolutely free agent, and uninfluenced by any corporation or group no matter how large. Our columns are open to all who have something of interest to say. We believe that Aluminum Man's annual message is of interest to the Aluminum industry—whether all agree with him or not.

Proof of our independence is made clear by our publication of Mr. Brile's letter in our last issue and in this one.—Ed.

To the Editor of THE METAL INDUSTRY:

In the discussion before the House of Representatives Ways and Means Committee on the preliminary tariff discussion, no proposal from any industry seeking an increase above the present duty rates met with more opposition or with greater interest among the trade than the proposal of Mr. Arthur V. Davis, president of the Aluminum Company of America, that the duty on aluminum ingots, pigs, etc., should be increased from the present duty of 2c. per lb. to 7c. per lb., and the present rate of duty on aluminum sheets from 3½c. per lb. to 11c. per lb.

The request was made on behalf of the Aluminum Company of America, the sole producer of aluminum in the United States, and the only absolute monopoly in the production of metals in the United States. This corporation absolutely controls the entire production of aluminum in the United States, and also half of the production of aluminum of the entire world. It not only produces aluminum, but actually competes in aluminum finished articles, like cooking utensils, stampings, novelties, etc., and also competes in the manufacture and sale of aluminum castings for automobile parts. It may further be stated that this corporation, practically controlling the entire aluminum industry in the United States, both the production of the metal itself and the manufacture from the raw material into finished aluminum products, seeks to extend further this absolute monopoly by preventing what little competition there is from abroad, by high and prohibitive rate of duty, thereby practically turning over to this Aluminum Company of America the entire aluminum industry of the United States.

Forty or more independent cooking utensil manufacturers and several hundred independent aluminum founders of the country, in whose business hundreds of thousands of dollars are invested, and hundreds of thousands of men employed, are absolutely powerless to come to the forefront and defend themselves against this greedy attempt on the part of the American producer, for they fear the antagonism of this monopoly, which would be in position absolutely to hamper or prevent their manufacturing if they opposed the will of the only producer of aluminum in America, and this would be especially true if a high tariff on aluminum is laid.

In the belief that the public will be interested in the facts in connection with this matter, we are taking the liberty of submitting to you herewith a copy of our brief submitted to the House of Representatives Ways and Means Committee during the preliminary discussion of tariff revision on aluminum. If this prohibitory tariff on aluminum is established, the housewives of America will want to know the reason why they have to pay an increased and unwarranted price for aluminum cooking utensils, vacuum cleaners, and other household utilities, made in part or in whole of aluminum, which will undoubtedly be the case if the Aluminum Company of America succeeds in gaining an absolute control of the production and marketing of aluminum in this country. Every owner of automobiles in America will be affected, because a turning over of this aluminum industry into the hands of the Aluminum Company of America, by preventing foreign competition, will mean either high priced automobiles because of the higher cost of aluminum, or it will mean a lessening of the use of aluminum parts, thereby decreasing the efficiency and quality of the automobiles in America. The Automobile Industry, through the National Chamber of Commerce and the Independent Aluminum Founders' Association strongly presented these facts to the House Ways and Means Committee.

BRILE & RATNER, INC.,
277 Broadway, New York City. L. M. BRILE, Pres.

A copy of the brief mentioned in the above letter is on file in our office. Unfortunately, it is too long to publish, but it gives the writer's record of the American producer in absorbing aluminum manufacturing plants, its financial status, some statistics of aluminum importations and his reasons why an increased tariff should not be allowed on aluminum.—Ed.

THE RIGHT MOLDING MACHINE

To the Editor of THE METAL INDUSTRY:

We were very much interested in Mr. William H. Parry's article on "The Right Molding Machine" in the February issue of THE METAL INDUSTRY, and as there may be questions from time to time which we would very much like to ask Mr. Parry, we were wondering if you would be kind enough to give us his address. We think this article very timely and interesting and would suggest that you have Mr. Parry follow this up with series of articles to show proper gating and plating of patterns and pattern plates in connection with molding machine he described. No doubt Mr. Parry has had a great deal of experience in his own line and we think the readers of your paper would appreciate a series of articles such as we mention above.

Wilmington, Del.,
February 16, 1921.

SPEAKMAN COMPANY,
James Fraser, Superintendent.

To the Editor of THE METAL INDUSTRY:

We have just read with interest Mr. Parry's article, "The Right Molding Machine," appearing in your current number.

What you say there concerning the hand operated molding machine we make is very good and sincerely appreciated, but I wonder where the notion came from that we "specialize in hand operated machines," and that we are "newcomers in the business." At the same time that we sent you our bulletin on the hand operated machine we sent also our bulletin on the electric operated combination molding machine and the electric operated jolt plate machine, and as a matter of fact we have been advertising ourselves as specialists in electric operated molding machines. Further, the hand operated machine to which you make particular reference has been built and on the market for something like 8 or 10 years.

We mention these facts so that if opportunity affords you can set us right before your readers as makers of electric molding equipment, which is the subject of our particular drive just now as regards molding machines.

Yours very truly,
New York, R. H. KELLEY, Secretary,
February 9, 1921. American Foundry Equipment Company.

ANNEALING BELT BUCKLES

To the Editor of THE METAL INDUSTRY:

Referring to your problem, No. 2909, on page 85 of your February issue, on the subject of annealing sterling silver belt buckles, would say that if you will use a Kenworthy Non-Oxidizing Annealing Furnace, there will be no necessity of all your pickling and cleaning process which you are struggling with.

We have these furnaces in different sizes, large and small, the capacity running from a few pounds for jewelers, up to several tons for wire and coarser products, and will be very glad to receive your inquiries and to have an opportunity to demonstrate to you our way of saving you time and expense.

CHARLES F. KENWORTHY, INC.
Waterbury, Conn., February 16, 1921.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; CORYDEN P. KARR, Exchange-Research }

ACID DIPPING

Q.—Can you give us the following information: What is the cause of metals getting black, after they are dipped in acid?

A.—The cause of metals getting black after they are dipped in acid is very often the method of dipping.

A good dip for brass which is bright consists of nitric acid 2 parts, sulphuric acid 1 part. Dip casting in solution, rinse in clean water; if necessary, dip again, rinse in hot water, and swing until dry. Other causes of metal getting black after dipping in acid are over 6% lead in the metal where 6% or more zinc is not present, traces of antimony or over .05 iron or phosphorus.

A metal, to dip with a nice color, should be free from impurities, contain a large percentage of zinc, and should be free from aluminum.—W. J. R. Problem 2,921.

BEARING METAL

Q.—We have been having considerable trouble in making our bearing metal casting. Can you give us a good mixture which will not get hot or grind when in operation? This metal must also be very hard.

A.—A good mixture that will not get hot or grind and give excellent results in heavy rolling mill work consists of 77 copper, 13 tin, 10 lead. Another good mixture used for street car work which is subject to hard pounding, consists of 84 copper, 12 tin, 3½ zinc, ½ lead. For general bearings and heavy duty the standard phosphor bronze is equal to almost all occasions, and if handled properly will give good results. It consists of 75 copper, 10 lead, 10 tin, 5 of phosphor copper.—W. J. R. Problem 2,922.

COLORING

Q.—Please give me a formula for Chocolate Bronze and for Verde Antique on brass.

A.—We quote from our issue of February, 1920, p. 91, and October, 1920, p. 478.

CHOCOLATE BRONZE.

The production of dark chocolate bronze tone upon brass is much more difficult than if the brass were copper plated or made from a brass high in copper, so will require manipulation to produce the desired results. We would suggest the following manipulations:

1. Cleanse and bright acid dip the parts.
2. Immerse in a solution consisting of the following:

Water .....1 gallon Temp. 180° Fahr.
Copper Sulphate .....1 pound

Immerse the brass parts for a few seconds in the hot copper solution. They will assume a green or gold tint. Then remove, wash in water and immerse in the following solution:

Water ..... 1 gallon Temp. 160 to 180° Fahr.
Polysulphide ..... 4 to 6 ozs.

or

Water ..... 1 gallon 160 to 180° Fahr.
Sulphide Barium .... 1 oz.
Caustic Soda .....½ oz.

Either solution will give an oxidized effect if the articles are previously treated in the copper sulphate solution. Afterwards remove, wash, dry and finally scratch brush to bring up the color.

If the articles made from brass were only slightly copper plated the Barium Sulphide solution would give the desired results immediately.

Another solution that can be used in the place of the copper sulphate to give the basic surface is:

Muriatic Acid ..... 1 gallon
Sal Ammoniac ..... 1 pound
Copper Sulphate ..... 1 pound

This solution can be used cold. Other manipulations as outlined.

VERDE ANTIQUE FINISH

Copper Sulphate .....4 ozs.
Zinc Chloride .....1 oz.
Ammonium Chloride .....2 ozs.
Sodium Chloride .....2 ozs.
Acetic Acid .....2 fluid ozs.
Water .....1 gallon

Brush over articles and stipple nearly to dryness. Make as many applications as intensity of green is desired. When thoroughly dry spray lacquer.—C. H. P. Problem 2,923.

CORE SAND

Q.—Can you suggest what is the best mixture for core sand that will knock out easily.

A.—A good core sand that will knock easily consists of

2,000 pounds of silica sand,
1,000 pounds of molding sand,
40 pounds of dextrine.

Temper with water and use 1 part core oil to 60 parts sand.

Another excellent mixture for light and medium work, which gives a nice smooth surface inside the casting, is made up of equal parts silica sand and molding sand. If too close and blowing occurs, increase the silica sand and temper with glutrine:

40—14 qt. parts of sand.
1—14 qt. parts of glutrine.
1 part of core oil.—W. J. R. Problem 2,924.

C. P. VS. COMMERCIAL ACID

Q.—We are planning to stock up on nitric and sulphuric acids for bright stripping of brass and copper, and we would be pleased to have your advice as to results we will obtain by using commercial acids for this work. Would chemically pure acids accomplish any better results?

A.—Commercial acids are used exclusively in the dipping of brass and copper. There would be no advantage in using chemically pure acids. Nitric acid 38% and sulphuric acid 66% are the strengths used in acid-dipping and pickling operations, and give the desired results. Chemically pure acids would give no better results and would cost several times as much as the commercial product.—C. H. P. Problem 2,925.

FILLING PITS WITH TIN

Q.—We have knives come to us for refinishing, and they are pitted so badly that we would cut the knife away in grinding them out. We understand there is a method whereby these holes can be filled in with a hot solution of tin. Kindly tell us what you know about it, or anything else that will help us.

A.—Tin is frequently used for coating steel knives that have become badly pitted in daily use, previous to silver plating. The tin fills up the pores or pits, gives a more even surface and avoids excessive polishing.

The method frequently used is to strip the silver from the knives by an electro strip made up of sodium cyanide.

Water ..... 1 gallon
Sodium cyanide ..... 8 ounces

The knives become the anodes and sheet steel or carbon is used as the cathodes; a strong current is used. The old silver deposit is rapidly reduced.

The strip solution, when it becomes saturated with silver, can be used as a replenisher for the regular solution. The knives should be cleansed and then they are ready for tinning. Pure block tin should be melted to a fluid state and then covered with about an inch of beef tallow.

Before immersing the cleansed knives in the molten tin they

should be immersed in a chloride of zinc flux. This flux is prepared by dissolving sheet zinc in muriatic acid, until no more can be dissolved. Remove any sediment by filtration and then add one pound of sal ammoniac per gallon to the zinc chloride solution.

Immerse the knives in the flux, drain and then immerse in the molten tin for a minute or so. Remove and shake off the excess of tin. The knives are then ready for regular silver plating.—C. H. P.—Problem 2,926.

IMMERSION BRAZING

Q.—Please tell me how immersion brazing is carried on.

A.—Immersion brazing is done approximately as follows:

If two pipes are to be brazed together, a hole is made in one and the other is fitted as closely as possible against it. If there is no perceptible opening between the pieces at the point of junction, it will be very much easier to weld. Wire the two pieces together firmly after having brightened the pieces at the point of junction and for some distance around it.

Blacken the parts of the pieces to be joined except at the actual places of juncture. After the blackening has become dry, some borax is dusted upon the bright portion at the joint and the whole affair is lowered into the zinc tank by means of wires. It requires but a few seconds for the pieces to become heated and then they are removed and gently shaken to remove the superfluous zinc which adheres over the brightened portion at the joint.

The work should come from the bath looking as neat as a wiped joint.—A. B. Problem 2,927.

IRON PANTAGRAPH TROLLEYS

Q.—Is there a mixture of cast iron which is anti-friction, hard and tough? I want to use it for pantagraph trolleys.

A.—To obtain very tough iron castings use low phosphorous pig iron, containing .030% sulphur and phorphorus and about 2.75% of silicon. Such iron would also be low in manganese. While cast iron has been used for bearings and other anti-friction uses, it is too hard for such applications unless perfect alignment is secured, and this is seldom possible. The Brinell hardness, even in the softest mixtures, is 175 to 225, so that it is very likely to cut shafts, etc. The Brinell hardness of copper wire is about 100, so that you may judge what a cast iron collector would do to a copper trolley wire.

Where the pantagraph trolley is used, the shoe is often made of a rolled aluminum alloy. An alloy of this kind is a rather poor anti-friction alloy, but its hardness is less than that of the trolley wire. Hence it wears out and may be replaced while the trolley wire is not injured.—J. L. J. Problem 2,928.

MELTING BRASS CHIPS

Q.—We handle brass chips and melt same into ingots. We have now a large lot of brass chips which contain 4.5 per cent oil by analysis. We have melted a little of same and find that we get a loss of 20 per cent. We tried to put some charcoal on bottom, middle and top of a crucible, but found that this did not help materially. We would like to know if there is any flux that we can put in a crucible to prevent the high loss in melting these brass chips.

A.—The best way to melt material of this class is to submerge it in a bath of melted metal. Start out by melting a few ingots of brass or composition in your crucible and after they are melted, add the brass chips and stir them under the surface as soon as possible. There should be very little loss, not over 4 to 6 per cent, by this method. It will be well to keep a cover of glass or borax on the melted metal, as these will prevent excessive oxidation. This can be done by placing broken glass or borax in the crucible with the ingots. Charcoal can be used with the glass. The important thing, however, is to make sure that the chips are held under the surface of the melted metal as soon as possible.

It will be very much easier and simpler in your melting if you can remove the oil before placing the chips in the crucible. This can be done by heating to a comparatively low temperature, say 300 or 400 degrees Fahr.—A. B. Problem 2,929.

ORMOLU FINISH

Q.—I am enclosing a sample of a finish which I have tried hard to duplicate without success, although I have tried all of the dips I can think of. I have a million pieces to finish as per sample and must necessarily make a production job of it. I will certainly appreciate it if you can suggest a way out of my trouble. I have tried zinc mats, bichromate solutions, iron solutions, all without getting the fine velvet finish this sample has.

A.—The sample finish upon brass is termed ormolu, or satin. The finish was produced in an ormolu dip. To produce this finish proceed as follows: Saturate nitric acid 38% with oxide of zinc until it has the consistency of a thick whitewash made of lime. Heat the acid dip so prepared by surrounding with hot water. Sulphuric acid should now be added until you obtain the silky satin appearance of your sample by test.

The method of manipulation should be as follows:

1st. Cleanse the brass parts as usual.

2nd. Immerse in a regular bright acid dip to produce an even surface. Wash in water.

3rd. Immerse in the satin or ormolu dip, being sure that the solution is thoroughly mixed each time the brass is immersed.

After the satin is produced, wash thoroughly in cold water, pass through a cyanide dip to remove acid stains and dry out as usual. If the ormolu dip does not contain enough sulphuric acid finish will be coarser; if too much, then the matt will be too fine. Always maintain the dip hot when in use.—C. H. P. Problem 2,930.

REFINISHING TABLEWARE

Q.—Does it pay to resilver worn tableware? How is this done?

A.—No. 1. As a rule it does not pay to resilver worn steel knives and forks. A satisfactory job cannot result if the steel is badly pitted. The pits cannot be filled up in plating. Quite frequently the knives and forks are hot tinned in a molten mixture of pure tin and silver—one ounce of silver being used to every pound of tin. This combination gives a hard, bright coating, which fills up the pits; afterwards the knives and forks may be silver plated and a good finish will result.

No. 2. Pewter and britannia after buffing (preferably sand-buffing), should be cleansed thoroughly, brushed down with lime paste, then rewashed and then struck well in a regular silver strike solution, high in cyanide and low in silver, using old steel files as anodes. It should then be finally plated in the regular silver plating solution. Quite frequently a mercury dip is used for britannia and pewter. This dip is composed of the following materials:

Water	1 gallon
Sal Ammoniac	1½ lbs.
Bichloride of Mercury	2 ozs.

A good film of mercury should be obtained. The above proportions may be increased or decreased as found best suited for the articles to be silver plated. Following the mercury dip, strike well in the silver strike and silver plate in the regular solution.

For heavy silver plating the silver solution should contain not less than three to four ounces of metallic silver per gallon, equal to 3¾ or 5 ozs. dry silver cyanide, based upon 80½% metallic silver. Quadruple plated steel knives have a deposit of 16 pennyweights of silver per dozen. This amount applies to the forks. Triple plate is 12 pennyweights per dozen. This is the standard weight. Double plate, 8 pennyweights. Single plate, 4 pennyweights.

For a good wearing silver deposit not less than 8 pennyweights of silver should be deposited upon a surface equal to one dozen steel knives.

A triple plate will require from two to three hours in a solution containing 3 to 4 ounces of silver per gallon. —C. H. P. Problem 2,931.

PATENTS

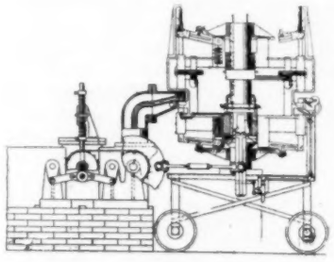
A REVIEW OF CURRENT PATENTS OF INTEREST

1,358,908. November 16, 1920. **Alloy for Electrical Contact Points.** Joseph A. Williams, Cleveland, Ohio.

The principal object of the invention is to provide an alloy for electrical contact points, which possesses low resistance, sparks but slightly, has good wearing qualities, and will maintain smooth and clean contact surfaces. This is accomplished by employing a base metal of low electrical resistance, and treating this base metal in a suitable manner to enable it to resist spark erosion caused by electric action by increasing the cohesion of its particles.

1,360,771. November 30, 1920. **Die-Casting Machine.** Richard T. McGee, of Wheeling, W. Va.

This invention relates broadly to metal casting apparatus, and more particularly to a mechanism for producing small castings of aluminum and other metals.



The primary object of the invention is to provide an apparatus for casting the metal slugs employed in the production of collapsible tubes, the caps for such tubes and the like.

A further object is to provide a continuously operating machine or apparatus whereby castings of the character mentioned may be rapidly produced in an efficient and wholly automatic manner.

1,360,272. November 30, 1920. **Lead Base Alloy.** Eliodoro de Campi, of Chicago, Ill., assignor to United Lead Company, of New York, N. Y., a corporation of New Jersey.

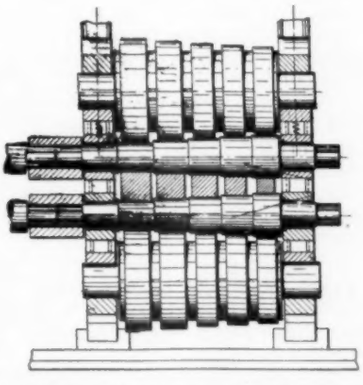
This invention relates to hard lead alloys for machinery bearings and like uses and particularly to those composed of lead hardened by the addition of one or more of the alkaline earth metals or according to the formulas set forth in Frary and Temple Patents Nos. 1,158,671, 1,158,672, 1,158,673, 1,158,674, 1,158,675.

The purpose is to improve the fluidity of such alloys when molten and particularly to restrain their tendency to dross so that they may be repeatedly melted without unusual impairment. The invention consists in the new composition herein disclosed and in the method of compounding lead base alloys to produce the results stated.

1,360,959. November 30, 1920. **Rolling Mill with Supported Working Rolls.** Arnold Kriwan, of Mariendorf, near Berlin, Germany.

This invention relates more particularly to that class of rolling mills for the elongation of material in which the working rolls are supported.

In rolling mills which are chiefly used for the drawing out of the material to be rolled, the diameter of the rolls should be as small as possible, because experience has shown that rolls of small diameter produce great elongation of the material to be rolled.

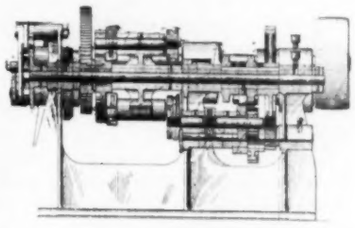


These rolls of small diameter, however, show, under the counter-pressure of the material to be rolled, a considerable sagging or deflection and must therefore be supported.

This invention has for its object to eliminate the defects of these known arrangements and to provide for an effective cooling of the working rolls. According to this invention rings are used as supports for the working rolls of small diameter, such rings revolving around fixed axles held by the housing frame, preferably by the insertion of balls or rollers between the rings and the axles.

1,359,554. November 23, 1920. **Metal-Spinning Machine.** Frederick G. Wieland, of Brooklyn, N. Y., assignor to Anchor Cap & Closure Corporation, of Brooklyn, N. Y., a corporation of New York.

This invention relates to sheet metal working, and specifically to improvements in machines for spinning sheet metal articles. In the form hereinafter described the machine is adapted for the spinning of closure caps suitable for use on vessels or containers used for the packing of food and similar purposes, although it is obvious that by changes in design of the metal shaping parts the machine may be adapted to the manufacture of articles of different forms and for other uses.



1,360,348. November 30, 1920. **Hard Lead Alloy.** George H. Worrall, Kirkwood, Mo., assignor to United Lead Company, of New York, N. Y., a corporation of New Jersey.

It has been discovered that, in small amounts, mercury has the property of increasing the hardness of alloys of lead with certain of the lead-hardening metals and that it improves such alloys in other respects and can be used for this purpose with considerable economy in the cost of production.

The class of alloys on which mercury has this effect include in general, those lead base alloys commonly or most practically produced by electrolytic deposition and those wherein the primary hardening effect upon the lead is produced by small percentages of one or more of the alkaline earth metals and also those containing small amounts of sodium, potassium, magnesium or lithium or combinations of these lead-hardening metals with or without other additions.

1,360,347. November 30, 1920. **Lead Alloy.** George H. Worrall, of Kirkwood, Mo., assignor to United Lead Company, of New York, N. Y., a corporation of New Jersey.

This invention consists in a hard lead alloy suitable for machine bearings and like purposes, and containing lead, magnesium and mercury with or without other ingredients. It has been discovered that mercury exercises a hardening effect on lead alloyed with certain of the lead-hardening metals such as magnesium and that it may be used for this purpose with economy and general improvement in the product alloy.

The new alloy is made substantially as follows:

To a quantity of molten lead there is added in any suitable manner an amount of magnesium constituting from, say, one-half of one per cent to three per cent of the product. This alloy if allowed to cool will be found to possess a certain degree of hardness according to the known effect of magnesium on lead. To this alloy is added either in the same vessel or elsewhere a small percentage of mercury generally less than 2% and the resulting alloy is then cast into ingots ready for sale.

1,360,346. November 30, 1920. **Lead-Base Alloy.** George H. Worrall, of Kirkwood, Mo., assignor to United Lead Company, of New York, N. Y., a corporation of New Jersey.

This invention consists in a hard lead alloy suitable for ma-

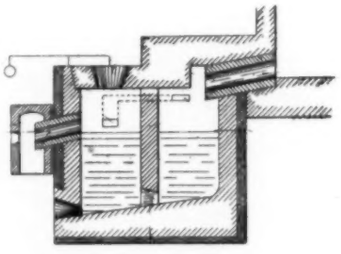
chine bearings and like purposes and containing lead, one of alkaline metals,—sodium or potassium, and mercury, with or without other ingredients. It has been discovered that mercury exercises a harding effect upon lead alloyed with either of these lead-hardening metals and can be used for this purpose with economy and general improvement in the characteristics of the resulting alloy.

1,360,339. November 30, 1920. **Hard Lead Alloy.** Thomas F. Wettstein, of Keokuk, Iowa, assignor to United Lead Company, of New York, N. Y., a corporation of New Jersey.

The invention is an improvement in hard lead alloys of the general class disclosed in Frary and Temple U. S. Patent 1,158,672, granted February 2, 1917, and more particularly in lead alloys containing barium as the principal hardening element. The invention consists in the method of making such alloys as herein disclosed and in the several products of such method as herein explained, all of which are bearing metals of superior properties useful for all the purposes for which more costly alloys have been heretofore considered indispensable.

1,361,754. December 7, 1920. **Front Discharge Chamber of Melting Furnaces.** Paul Dhé, of Paris, France.

This invention relates to an arrangement of front discharge chamber applicable to melting furnaces generally serving for the melting of materials such as metal, glass, volcanic rock, and fusible clay.

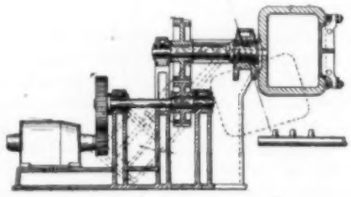


The discharge chamber is divided in a manner known more particularly in glass making, into two compartments in communication with each other at their lower part, the first of the said compartments receiving the melted material which issues from the melting furnace and allowing it to be freed from impurities and gas bubbles which it may contain, while the second compartment receives the decanted material and has a tap hole placed at a suitable level.

1,362,345. December 14, 1920. **Transfer Table for Rolling Mills.** Henry G. O'Brien, of Warren, Ohio.

This invention relates to improvements in transfer tables for rolling mills; it consists in mechanism peculiarly adaptable to varying conditions of service; and, while not so limited, it is applicable with notable advantage to the cooling-table of a strip-mill. It will be shown and described in this particular application, but the fact of wider applicability will be apparent to one who reads through this specification.

1,362,381. December 14, 1920. **Detinning.** Walter C. Zacharias, of Pittsburgh, Pa., assignor to Steel Works Appliances Company, of Pittsburgh, Pa., a corporation of Pennsylvania.



The invention described herein has for its object the transformation of the tin to such a structural condition that it can be readily detached from the surface of the other metal, by mechanical treatment as vibration, impact, etc. In general terms, the invention consists in heating the coated articles and then subjecting the articles while heated, to blows, vibrations, or other mechanically applied stressse whereby the tin is reduced to a powdery condition and dislodged from the metal surfaces. The invention is hereinafter more fully described and claimed.

1,362,739. December 21, 1920. **Aluminum Alloy and Process of Alloying Aluminum.** Otto Fritz Reinhold, of Maplewood, N. J., assignor, by direct and mesne assignments, to Foster Reinhold Laboratories, of Newark, N. J., a corporation of New Jersey.

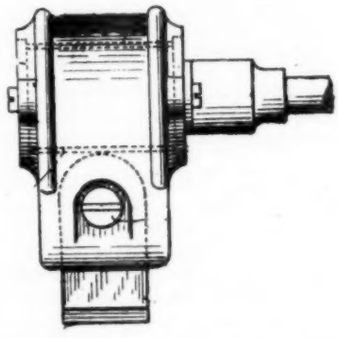
This invention relates to a process of forming what will be termed an aluminum alloy, as a coating on an aluminum or an aluminum alloy plate. The exact character, physical and chemical, of the union formed between aluminum and other metals in the practice of the invention is not known, so it is to be understood that the term "alloy" is used loosely throughout the specification and claims and where so used is intended merely to cover the union of metals in the peculiar manner resulting from my discovery.

1,364,051. December 28, 1920. **Process of Electroplating.** James S. Graff, of Newport, R. I.

This invention relates to an improved process or method of electroplating metallic bodies as well as to the improved coating and the article coated thereby.

One of the objects of the present invention is to provide an improved method of coating metallic bodies with a primary view of preventing erosion or oxidation of the metal so treated.

1,361,032. December 7, 1920. **Electric Soldering Iron.** Ferdinand Eichenberger, of Aaran, Switzerland, assignor to Aktiengesellschaft, Kuminler & Matter, of Aaran, Switzerland, a Swiss corporation.

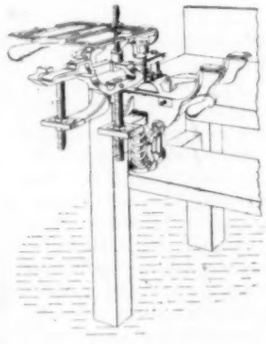


This invention relates to electric soldering-irons, and a primary object is to provide a construction wherein a heater can be readily inserted into the head of the iron in such a manner that its heat is efficiently transferred to the bit.

An electric soldering-iron, according to the invention, comprises a head preferably of aluminum, that has a bore running in the direction of the handle, and a cut extending in the same direction and opening into the bore, and an electric heater fitting into and clamped in the bore.

1,363,911. December 28, 1920. **Core-Making Machine.** Roscoe C. Pattisen, of Detroit, Mich.

This invention relates to core-making machines, and has for its object a machine which can be attached to a bench and which is capable of not only inverting the core box but also turning the same through one quarter of a turn so as to bring the core and the box from a position on the bench to a position in front of the bench, where it is easily accessible to the operator.



Another feature of the invention is a special arrangement of devices for lifting the core-box from the core and a special form of lock for holding the core-box in lifted position.

1,363,657. December 28, 1920. **Method for Producing Manganese or Alloys of Manganese.** By Michael Sture Kalling and Sven Dagobert Danieli, of Trollhattan, Sweden, assignors to Aktiebolaget Ferrolegeringar, of Stockholm, Sweden, a limited company.

The present invention has for its object a process for manufacturing manganese or manganese-alloys with low content of carbon and silicon.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Continuous Pickling of Strip Brass

A Description of a New Departure in Rolling Mill Machinery

Written for The Metal Industry by WADSWORTH DOSTER

In the various processes attendant on rolling of brass and other non-ferrous metals, certain obstacles have long proved a thorn in the side of rolling mill superintendents and a peculiar source of irritation, because although they seemed readily removable in theory, they were flanked by troubles of a practical nature. Some of these difficulties, in the course of evolution, have been overcome, and the solution of each has marked a milestone in the progress of the industry.

Brass mill finishing machinery has been developed to a fairly high point of efficiency, speaking generally. Slitting machines, shears, stretching or patent leveling machines, cutting-up apparatus, metal saws and the like, which constitute the finishing department of the mill, in which are performed the last operations before shipment, have fortunately been standardized to a large extent and have overcome a good proportion of their difficulties, especially during the last few years when the demand of heavy war production practically compelled improvements even at a high primary cost. But in the same department there is one process which has made, until lately, comparatively slow progress, i.e., the descaling or pickling process. When a coil of brass is delivered to the annealing furnace from the rolls, it emerges with a deposit of "scale," which must be removed in order to deliver the metal to customers in satisfactory condition, having a bright appearance, free from oxidation and with no evidence of stains or particles of any nature. The work is accomplished by "pickling" or immersing the coil in a vat or pickle tub containing usually sulphuric acid. Opinions differ as to the best means of raising and lowering the coils into the acid, some plants using cranes or air-hoists, others preferring hand operation with special tongs, and a multiplicity of acid resisting devices usually developed separately in each mill. The acid must next be removed by rinsing the coils in water, the customary sequence being first a cold water bath and next a hot water tank to facilitate drying. The drying is the final operation and is performed by what is known as a sawdust drying-out machine, in which the coil is unwound and the strip passed through rubber wipers to scrape back the water, a mass of banked sawdust to absorb the remaining moisture, a set of brushes for removing sawdust particles, and a block or drum for rewinding.

Now a coil of brass is apt to be rather tightly wound as it comes from the finishing rolls. Thin metal especially, which is likely to be in lengths as great as 500 feet or even more in some cases, is so tightly laid up as to interfere with prompt and equal action of the acid unless the coil is loosened to a great extent, commonly known as "opening up." Various coil opening machines have been tried, but the hand method has been largely used, which must necessarily be costly. It has long been felt that some sort of a continuous process could be devised by which the strip could be passed mechanically through the acid and water tanks and rewound automatically at the exit end. Various attempts have been made in that direction. In fact, in a few plants which specialize on radiator metal, which is about .005 inches in thickness, and therefore within the term "thin metal," a fairly good arrangement has been rigged up by a combination of the pickling tubs with the sawdust dry-out machine, the block of the latter being employed to pull the strip successively through the pickle tub, the rinsing tanks, and its own sawdust box.

This is not as easily accomplished as might seem. The finishing man is situated between two fires, so to speak. On the one hand he must speed the process sufficiently at least to equal the cost of earlier methods. On the other hand the speed must be slow enough to permit the acid to perform its work. If the percentage of acid strength is increased or heated in order to cut down the time element, it causes fumes offensive to the operators and it is difficult to avoid a high labor turnover. A host of minor difficulties appear as well, such as the means of starting the strip through the machine, the necessity of raising it from the acid whenever the device is shut down, the means of splicing one strip to another to avoid interruption, and similar points. Then, too, many of the acid resisting materials which proved satisfactory under the old method are impossible in the continuous process, since, naturally, such machine parts as gears, rolls, guides, shafts, brackets, etc., cannot be expected to perform satisfactory work if deteriorating under the acid and its fumes, even though the deterioration be slow.

A new continuous process has now been evolved. It has been in commercial operation about three years, standing the test of criticism successfully. It is in the form of a machine known as the Sundh Continuous Strip Cleaning Machine, made by the Sundh Engineering and Machine Company, Philadelphia, Pa. It is similar in general to the makeshift machines above referred to as used in several plants by a combination of their pickling and drying facilities, but differing from them in one radical respect, viz., the substitution of steam in the place of sawdust for the drying operation. It also offers a great list of additional advantages, some of which will be described.

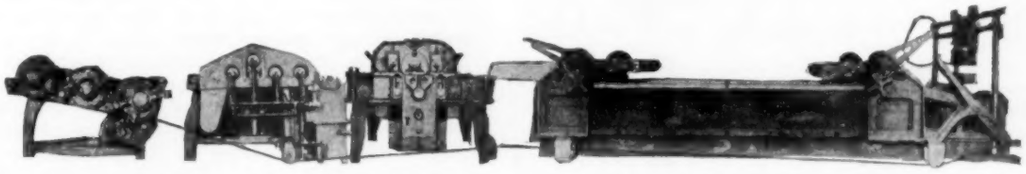


FIG. 1. ASSEMBLED SUNDH AUTOMATIC STRIP CLEANING MACHINE

The Automatic Strip Cleaning Machine has five distinct units, each really a machine by itself, but all under the same control. The complete assembly is shown in Fig. 1. First is the splicing unit (Fig. 2), used for soldering the front end of each strip to the rear end of the strip ahead, which is performed by the operator with a foot treadle while he holds the two ends in his hands. The metal passes next into the pickling unit (iFg. 6), which is nothing more or less than a standard pickle vat equipped with a series of rolls over which the strip passes back and forth underneath the surface of the acid, so as to permit a maximum time period of exposure to the acid. From here the strip travels into the washing unit (Fig. 3), an arrangement of cold water sprays accompanied

by rotary brushes traveling at high speed to supply the rinsing and scouring action necessary. The next step is the drying unit (Fig. 4), which is the chief feature of the machine.

On the front end of the drying unit is a small hot water tank, into which the strip is guided by suitable rolls, the heat being supplied by the steam and condensations of the steam rolls below described. A pair of hot air sprays, one for each side of the strip, come next, blowing back the bulk

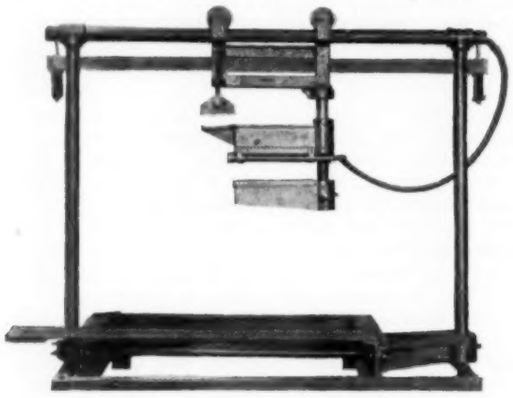


FIG. 2. SPLICING UNIT

of the moisture and leaving only a thin film of water as the strip enters the steam-heated drying rolls. The latter are placed in such a way as to afford a contact with the strip on about three-fourths of their surface and entirely remove any vestiges of moisture that remain. From this point the strip goes to the winding unit (Fig. 5), a reeling machine equipped

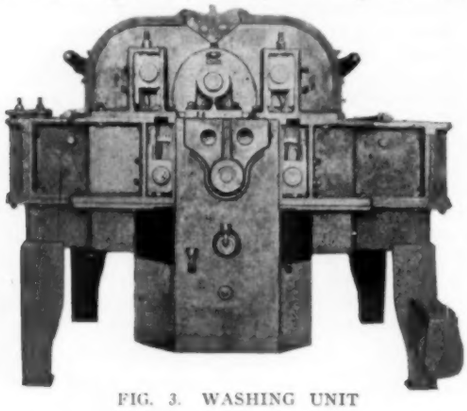


FIG. 3. WASHING UNIT

with three power-driven collapsible blocks, and is delivered in a neatly wound coil.

Three strips may be handled simultaneously, not exceeding 14 inches width each. Any one of the three may be stopped independently of the other two for splicing at the front end, or removing at the rear end of the machine. Starting and stopping is controlled by hand-levers at each end, and any operator may start or stop any strip independently of

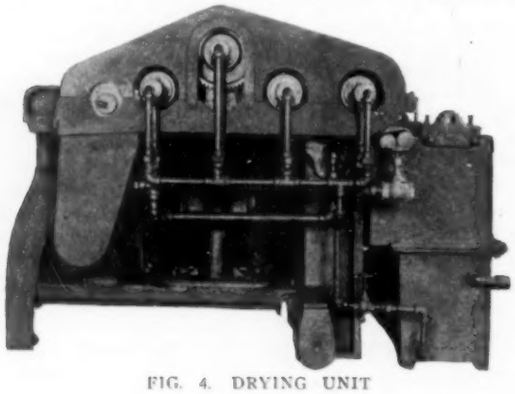


FIG. 4. DRYING UNIT

his associates. The power is derived from three 3 H. P. motors from a single control, the latter not being necessary to the operation, however, since the starting and stopping of strips is accomplished through clutches.

Naturally the chief element in the consideration of such a process must be its production. The cost per pound of metal is also fundamental. On both of these points the Strip Cleaning Machine scores heavily. It normally requires three operators, but in some mills only two men are used, and even further economy is expected where a battery of three or four

FIG. 5. WINDING UNIT

machines are in operation side by side. With this crew, about 100,000 to 120,000 feet of thin metal can be finished complete in nine hours' time. It should be remembered that the process includes not only the drying and cleaning, but likewise the pickling and rinsing, which previously have been conducted as separate operations, each having its own cost. The daily poundage naturally will vary with the thickness and width of the metal, but either different thicknesses or different widths may be handled simultaneously without difficulty.

Not the least advantage of the new process is the complete elimination of sawdust. Under the most favorable conditions sawdust as a cleaning medium has its limitations. Some mill superintendents frankly term it a nuisance. The supply must be replenished continually since it becomes unfit for use as soon as it has absorbed moisture to the saturation point, and even though its life may be prolonged by drying for repeated use, it ultimately becomes useless and must be replaced. Drying the sawdust is a problem in itself. Much experiment with steam coils for the purpose has been fruitless, for instead of evaporating the moisture from the wet sawdust as fast as it is absorbed in a sawdust drying-out machine, the coil shows a tendency to diffuse the vapor to the dry sawdust, thus destroying its own object. The storage of sawdust alone is troublesome, certain mills on the seacoast having found it impossible to prevent its absorption of moisture from the atmosphere, one of them buying expensive hardwood sawdust on this account and all of them declaring it difficult to transport without general untidiness.

Quite a few brass rolling mills have lately been receiving complaints from customers that small particles of sawdust remained on the brass upon its receipt. It seems that even the best sawdust drying-out machines will occasionally leave small particles on the strips. They cause peculiar difficulties. For instance, in a coil of metal .002 inches thick, annealed very soft, if a small particle of sawdust or any other foreign substance lodges on the surface at a point near the center of the coil, it will cause a dent, which in turn appears in a large number of successive folds as the strip builds up on the winding drum, causing the rejection of the whole coil as scrap. Another objection is that when metal is used for drawing operations or other press work, the sawdust interferes with

FIG. 6. PICKLING UNIT

proper action of the tools. As a result, the antagonism to sawdust for drying purposes is quite general and the successful introduction of steam as a substitute is causing much interest.

Among the incidental advantages of the continuous pickling process, for which there is insufficient space except for passing mention in an article of this kind are: the reduction of floor-space, the clean efficient appearance of the pickling department, the economy of acid, popularity with the operators, the removal of buckles from the strips, the avoidance of injury to metal by opening up coils, and also a slight saving in power consumption. A further claim is made that the safety features have practically reduced to a minimum the hazards of the pickling room. All of these points naturally are subordinate to the main advantage, which is the saving in cost.

Although not in universal use as yet, the Automatic Strip Cleaning Machine has superseded the earlier process in a number of prominent mills, including the National Conduit and Cable Company, both mills of the Stamford Rolling Mills Company, both plants of the Bridgeport Brass Company, Chase Rolling Mill Company, Chase Metal Works, Michigan Copper and Brass Company, West Virginia Metal Products Corporation, and introductory installations abroad (names used by permission). Most of these plants have at least two machines each. In addition, a number of mills are either using the process or planning its adoption very shortly, but are unwilling to be quoted officially until they have used it over a longer period.

A similar machine is now being developed for "roll delivery pickling," to apply the continuous process to metal pickling operations which occur between successive passes through the rolls, in which case the problem is somewhat simplified and the drying element eliminated. If successful, it will be made the subject of a separate article.

ELECTRIC MOLDING MACHINE

Aside from the hand-operated molding machine described in William H. Parry's article in THE METAL INDUSTRY February, 1921 (p. 61), the American Foundry Equipment Company manufacture a machine which operates by electrical power.

Mounted patterns are attached to the cradle of the machine by hook bolts engaging between the battens. Flask sections are then placed on the mounts and sand shoveled in as usual. The method of mounting patterns is similar to that for the hand-operated machine, and pattern equipment made for it can readily be adapted to the electric machine.

Jolting the molds is a power operation. The cradle and load are raised vertically, then dropped; this being repeated automatically until the desired density of sand is obtained. The speed of jolting, 100.

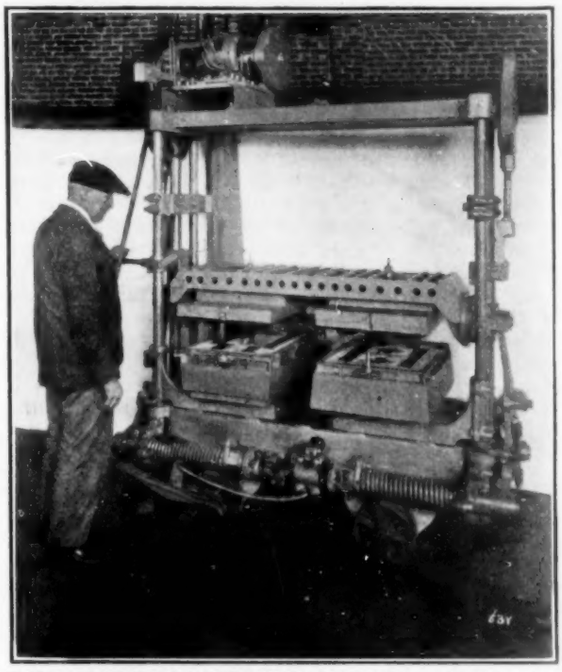
A double-end foot lever at the front of the machine starts and stops the jolt motion by a clutch on the cam disc shaft at the rear. Large adjustable torsion springs counter-balance the weight of the cradle and load to any extent desired. A powerful expansion spring adds impetus to the jolt and prevents whipping or rebound.

Rolling over the mold is an operation consisting first of raising the cradle by power a suitable distance, then releasing its heavy locking pin and giving it a half turn by hand.

The table lifting motion is controlled by the clutch lever at the left end of the machine. It operates by sprocket and chain connection from the motor countershaft to a pair of pinions which are each in engagement with a novel heart-shaped crank head surmounting each of the two lifting arms of the cradle. Upon these crank heads reaching their highest position, a shift of the clutch lever stops the cradle. It is then rolled over by hand until the two halves of the mold now hang from the under side of the inverted cradle.

Squeezing the mold is a power operation which immediately follows the rolling over. The clutch is again thrown in and the heart-shaped crank heads allowed to make one full turn around their pinions. In this one revolution the squeeze is applied to the mold and the pattern drawn. At the half way point, i. e., when the crank heads are in their lowest position and the pinions at their apex, the mold is under powerful compression. At this point the clamp bar automatically releases and drops to a position in the machine base.

Pattern draw: This follows the squeezing operation without stopping the machine. By the dropping of the clamp bar at the point of greatest compression, the flask sections are of course disconnected from the cradle and remain on the table rests beneath. Proceeding without stop, the crank head motion smoothly raises the cradle, to which the patterns are

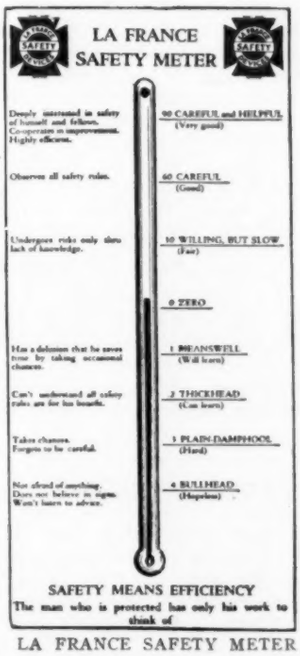


AMERICAN FOUNDRY EQUIPMENT COMPANY ELECTRIC MOLDING MACHINE NO. 72. DRAWING THE PATTERN

still attached, neatly drawing them from the cope and drag halves of the mold.

The clutch is again thrown out as the cradle reaches its highest point of travel. Next the steel table rests are released by an automatic trip and swung outward, leaving space for the operator to remain standing between. Cores are now set, the mold closed in the usual way, and then placed on the floor for pouring.

LA FRANCE SAFETY METER



LA FRANCE SAFETY METER

A new device has been developed for helping men to be careful. It works on them through their humorous side and jokes them into taking care of themselves.

The LaFrance Safety Meter covers the whole story of industrial safety in a humorous way that has been found to be more impressive than a long lecture.

The device has a movable indicator that shows one's state of mind toward being careful. Represents an accurate forecast of a person's prospects for the enjoyment of long life, health and happiness rated by his attitude toward the Safety First Movement.

The "Safety Meter" has proved very popular with safety men all over the country, and the American-LaFrance Fire Engine Company, Elmira, N. Y., will gladly send free copies on request.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Mr. H. S. Simpson, president, National Engineering Company, 549 W. Washington St., Chicago, has given $1,000 to the American Foundrymen's Association. Mr. Simpson has made this contribution without any restrictions whatsoever, expressing his confidence in the Board to use the funds wisely for the good of the foundry industry.

The research fund of the A. F. A. is gradually increasing. In 1916, following the Cleveland Convention, the Cleveland Committee found, after paying all bills, they had a balance of $337.11. This, by resolution of the Committee, was voted to the American Foundrymen's Association to start a research fund and was deposited with the Superior Savings and Trust Co., in a savings account, and on December 31, 1920, amounted to $394.89.

The next contribution was from Mr. Thomas W. and John C. Pangborn. This was announced at the Columbus Convention last October. This fund was deposited with the Harris Trust Company and on Dec. 31st, with interest, amounted to $2,512.50, and with the addition of the Simpson Fund of $1,000.00, there is in the research fund, a total of $3,907.39. This does not include any of the endowments received, the income from which is to be used for making annual awards.

The officers now have under consideration, the starting of some special research work that will be of general benefit to the industry, including all classes of foundries, and we will report further what these plans are when they are in a more definite form.

ENGINEERING STANDARDS COMMITTEE

A conference on the standardization of insulated wires and cables was held in New York, February 2d. The conference was called by the American Engineering Standards Committee at the instance of the American Railway Engineering Association.

It was unanimously decided that "The unification of specifications for wires and cables for other than telephone and telegraph use should be undertaken under one general plan, covering substantially all the more important uses." It was agreed that work on the following should be included: Conductor, quality, stranding, sizes, rubber insulation, varnished cloth insulation, impregnated paper insulation, magnet wire (including enamel, cotton and silk insulation), fibrous coverings (including asbestos), sheaths, armor, standard make-ups.

Nearly a dozen organizations now have important publications on the subject, and it was agreed that the proposed work should be a unification of the specifications and standards already in existence, rather than an attempt to formulate entirely new standards, except in fields not already covered.

It was the consensus of opinion that, in order to promote export trade, it would be desirable to have all the American wire and cable standards assembled in a single book, which while giving due credit to the participating organizations would appear to foreign wire and cable purchasers as a complete book of American Standards, rather than as the standards of societies comparatively unknown abroad. This has been done in a very thorough way by the Germans and to a considerable extent by the British, thus placing Americans at a decided disadvantage in foreign trade.

The proposed work will be carried out under the auspices and rules of procedure of the American Engineering Standards Committee.

FEDERATED ENGINEERING SOCIETIES

A two-day conclave of engineers and technologists from all sections of the country was held in Syracuse. Herbert Hoover, president of the American Engineering Council of the Federated American Engineering Societies, announced the appointment of a committee on Elimination of Waste in Industry.

The appointment of this committee, according to Mr. Hoover, marks the beginning of what is officially styled by this council as a great national assay of waste, in which from 100,000 to 200,000 engineers functioning through the council will attempt by studying the nation as a single industrial organism to locate the weaknesses in the country's production system.

A preliminary survey, it is announced, has already been organized and the different elements making for production waste, such as labor conflict, decreases in individual productivity, lack of co-ordination, and many other sources of industrial failure, will be brought under the close scrutiny of the organized engineers of the nation with the aim of solving pressing economic problems.

INSTITUTE OF METALS

At the annual general meeting in London, March 9-10, 1921, at the House of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S. W., the following papers of interest will be given:

(1) "Stages in the Re-Crystallization of Aluminium Sheet on Heating, with a Note on the Birth of Crystals in Strained Metals and Alloys." By Professor H. C. H. Carpenter, M.A., Ph.D., A.R.S.M., F.R.S., past president, and Constance F. Elam, Member (London).

(2) "Some Notes on Calcium." By P. H. Brace (East Pittsburg, Pa., U.S.A.). (Presented by Dr. J. L. Haughton).

(3) "Plastic Deformation of some Copper Alloys at Elevated Temperatures." By Professor C. A. Edwards, D.Sc., Member, and A. M. Herbert (Swansea).

(4) "The Action of Reducing Gases on Heated Copper." By H. Moore, O.B.E., B.Sc., Member, and S. Beckinsale, B.Sc. (Woolwich).

(5) "The Season Cracking of Brass and other Copper Alloys." By H. Moore, O.B.E., B.Sc., Member, S. Beckinsale, B.Sc., and Clarice E. Mallinson, M.B.E., B.Sc. (Woolwich.)

(6) "The Constitution of the Alloys of Copper with Tin, Parts III and IV." By J. L. Haughton, D.Sc., F. Inst. P., Member (Teddington).

BOSTON BRANCH, A. E. S.

Boston branch met Friday, February 4, at the Quincy House, Boston, with President Mackie in the chair. The reading of the minutes was approved, communications read and placed on file. One application was received and referred to the board of managers. The banquet committee made a report stating that all plans were completed and that the principal speaker of the evening would be Professor Thompson of Boston College, who would speak on the "Deposition of Metals." Our president, Mr. Mackie was invited to give Providence Branch a talk March 4, 1921, which he accepted. Boston Branch will hold open meeting for awhile so as to get the Platers of Boston more interested in the Society. Mr. Mackie gave another one of his lessons in chemistry which was most interesting.

The Branch met at the American House, Boston, Friday, the 18th, changing from the Quincy House. President Mackie was in the chair, going through the regular order of business. Two applications were received for membership and referred to the board of managers, and two were elected to membership. The banquet committee will make their final report at the next meeting of the Branch. A motion was passed to make Prof. M. De Kay Thompson, of M. I. T., Honorary President of Boston Branch. Election of officers will be held at our next meeting.

NEW YORK BRANCH, A. E. S.

President Sterling presided at the January Meetings of the New York Branch of the A. E. S.

Laboratory Chairman, Joseph Haas, Jr., exhibited samples of Black Nickel deposits, he produced in a Black Nickel solution containing no sulpho cyanide salts. The samples were pronounced

excellent. A paper submitted by A. Pflomm, entitled "The Polishing and Plating of Die Castings," was read and discussed.

C. H. Proctor, father of the A. E. S., spoke on the necessity of up-to-date facilities in the electro plating industry and the progress made by the A. E. S.

The twelfth annual banquet was held at the Aldine Club on February 19, 1921. It was a great success in every sense of the word. The technical session, an extended report of which is given in this issue of THE METAL INDUSTRY, was most interesting and valuable. The social side of the meeting was most enjoyable. The affair was managed with the customary efficiency of the New York branch.

MILWAUKEE BRANCH, A. E. S.

The annual banquet of the Milwaukee Branch, A. E. S., will be held at the Maryland Hotel, 137 Fourth Street, Milwaukee, Wis., Saturday, March 19, 1921, at 7.30 P. M.

Arrangements have been made for very interesting speakers and papers, and an invitation has been extended to all manufacturers and others interested in the deposition of metals. All who will attend will appreciate this interesting meeting and will receive a hearty welcome.

INDIANAPOLIS BRANCH, A. E. S.

The Indianapolis branch held a special called meeting February 6, 1921, to take up convention work. The meeting was called to order by President Hennessey.

It was decided to hold a banquet at Hotel English Saturday, February 19, 1921, and invite all eligible platers in the vicinity that are not members of the A. E. S. One new member was elected.

CONVENTION WORK

Convention headquarters will be the Claypool Hotel. Dates of convention, June 29-30, July 1-2. The committees appointed are as follows: Banquet, B. D. Aufderheid; program, publicity and exhibits, George Barrows and C. A. Ormsby; educational, B. D. Aufderheid and A. C. Hoffman; transportation, James Walsh; entertainment, F. McDonald, George Becktol, R. McCracken, H. Maze and James Walsh. It was decided that other committees would be appointed later.

ROCHESTER BRANCH, A. E. S.

The eighth annual banquet of the Rochester branch will be held at the Hotel Seneca March 19, 1921, at 6.30 P. M. Tickets will be $3 each.

METROPOLITAN BRASS FOUNDERS

At the last meeting of the association F. H. Landolt, of the Penn Brass & Bronze Company, was elected president, and W. E. Paulson, of Thos. Paulson & Son, Inc., was elected secretary and treasurer. John Hamilton, of R. Hamilton & Son has been made vice-president. Our executive committee consists of the following: Thomas Harper, of Thomas Harper; Joseph Bechtold, New York Brass Fdry.; Thomas Williams, E. A. Williams & Son.

During the past year the association feels that it has held its own in being able to retain practically all of its old members and to take on several new ones. We have inaugurated a policy of endeavoring to have present at each monthly meeting some one familiar with foundry practice to address us on technical subjects and on other occasions we have been addressed by men familiar with general trade and business affairs. We expect shortly to inaugurate an intensive campaign for the increase of the membership of this organization.

ASSOCIATION OF BRASS MANUFACTURERS

The next meeting will be held at the Rose Room, Hotel Sherman, Chicago, Illinois, Thursday, March 24, at 10:00 A. M. It is very important that every member of the Association be in attendance.

WASTE MATERIAL DEALERS

The nominating committee of the National Association of Waste Material Dealers, Inc., composed of Albert T. Hicks, Aaron Bers, Joseph Turkus and Charles A. Barnes, advisory member, has filed with the secretary of the association the following list of nominations to be voted on at the annual meeting of the association, to be held at the Hotel Astor, New York, on March 16.

For president, Frank C. Overton; for directors, two years, F. W. Reidenbach, Charles A. Barnes, Harry R. DeGroat, Harry S. Grant, Alex W. Burmon, Isidore Cohen, Isidore Klous, Fred Mayer, E. B. Friedlander, A. Glant, A. J. Moran and M. B. Speer.

The above association, which is an incorporated organization, elects each year a president and twelve directors, who serve for two years, the entire board being made up of a president and 24 directors.

The association has been making rapid strides during the past year in increasing its membership and in broadening out the service rendered to members. It has been the means of bringing about methods of co-operation between dealers and consumers, which were thought absolutely impossible only a few years ago.

The eighth annual banquet of the association is to be held at the Hotel Astor, New York, on the evening of Tuesday, March 15, and present indications are that over 500 dealers and consumers will be present.

The annual meeting of the association will be held at the Hotel Astor, New York, on Wednesday, March 16, at 10 A. M., for the purpose of electing officers and directors for the ensuing year, and to act on any other matters which may properly come before said meeting. A meeting of the Metal Division will be held on March 14 at 2.30 P. M.

METAL TRADES ASSOCIATION

The National Metal Trade Association will hold its annual convention at Hotel Astor, New York, on April 18 to 21, inclusive. The first day will be devoted to meetings of the executive committee and the local secretaries and a dinner for the latter in the evening.

The convention sessions proper will be held Wednesday and Thursday and the annual banquet Wednesday evening.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

May 23d through 26th has been set as as the date of the Spring meeting of the American Society of Mechanical Engineers. It will be held in Chicago at the Congress Hotel.

Sessions are planned by the professional sections on Aeronautics, Fuels, Management, Material Handling, Machine Shop, Power, Forest Products and Railroads.

DEATHS

ADELBERT P. HINE

Adelbert P. Hine, 69, for half a century identified with the Coe Brass plant, Torrington, and the American Brass Company, died suddenly on February 16 at his home in Woodbury. Death was due to heart disease, and came while Mr. Hine was preparing to retire for the night.

Mr. Hine was born in Waterbury, but spent the greater part of his life in Torrington. He entered the employ of the Coe Brass Manufacturing Company as an office boy, but rose rapidly to a place of responsibility. He became superintendent of the plant in 1901, succeeding Major A. F. Brooker. In 1904 he was made superintendent of all the plants of the American Brass Company, and held that office until January 1, 1913, when he retired in order to devote all his attention to his private affairs. He continued his associations with the American Brass Company, however, in the position of advisory superintendent and consulting engineer.

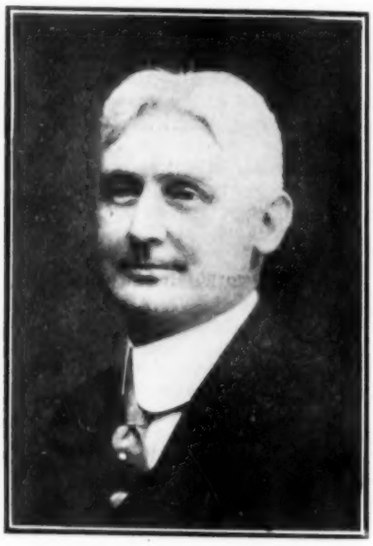
Shortly after his promotion to the superintendency of the American Brass plants he moved to Waterbury, where he

remained until about nine years ago, when he moved to Woodbury. His interests were varied, and besides being a heavy investor in realty, he was principal owner of the Connecticut Mill Supply Company and actively identified with other concerns.

His wife and one sister survive. His only son, Laurence, a young man of about 20 years of age, was killed in an explosion in New York City on January 27, 1902.

DR. WILLIAM APP JONES

The readers of METAL INDUSTRY, particularly those who recall the early issues, will remember the splendid contributions of Dr. William App Jones, in whose death we all lose a good friend and advisor. He died on Friday, February 18, at his home in Tuckahoe, N. Y., aged 47 years. His widow and a sister survive him.



DR. WILLIAM APP JONES

Educated in chemistry, the doctor gave practically his entire life in the interest of the pyroxylin development, and was frequently referred to as the "Dean of the Industry."

Following his graduation in Hillsboro, N. C., he entered Johns Hopkins University as a post-graduate student, and graduated from there, but remained at the University for one year as an assistant to Dr. Ira Remsen.

His special training and a natural aptitude for handling cellulose substances, brought the doctor in contact with Commodore Leonard Richards, at that time the head of the Boston Artificial Leather Company, later known as Richards & Company, with a large plant at Stamford, Conn., devoted entirely to the manufacture of lacquers, enamels, other pyroxylin solutions and artificial leather.

For several years these products have been known as Zapon, and represented by two companies—the Celluloid Zapon Company and the Zapon Leather Cloth Company—with Dr. Jones as the president and actively directing the interests until recent months.

His contributions to the technical papers, particularly with reference to metal finishing, were looked upon as authoritative, and were always couched in terms easily understood.

For many years he sponsored and gave much time to the upbuilding of an organization of electroplaters. It was easy for him to view the future, and he recognized the values and possibilities of the electroplater's art. As an executive, he won the hearts of his people, and made a determined stand at all times for business policies that would make good friends of the trade at large.

JOSEPH L. ROGERS

Joseph L. Rogers, for many years engaged in the tin and sheet metal business at Trenton, N. J., died at his home in that city recently, after a long illness. The deceased, who was 74 years old, was born at Reading, Pa., and learned the trade of a tinsmith with his father when he was but 15 years old. He started in business in Trenton nearly forty years ago with a capital of only $30. He was stricken with rheumatism several years ago, and during his illness his sons took care of his business. He is survived by two sons, his wife having died many years ago.

HENRY C. SEIDEL

Henry C. Seidel, president of the R. B. Seidel, Inc., Philadelphia Black Lead Crucible Works for the past twenty years, died at his home, Gibraltar, Pa., February 12, aged 70 years.

Mr. Seidel, until a few years ago, was also engaged in the forging business, having owned and operated a steam forge at Lorane, Pa., turning out iron forgings for locomotives and various other uses. He was a great admirer of fast horses and very reluctant to give up his thoroughbreds for the automobile.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Robert C. Weller has been appointed general sales manager of the Lakewood Engineering Company, with headquarters at Cleveland. Mr. Weller is in full charge of sales work.

Frank Hodson, president of the Electric Furnace Construction Company, Philadelphia, has been elected member of the Executive Committee of the Philadelphia Foundrymen's Association.

Carlton R. Dodge has been appointed Western sales manager of the Lakewood Engineering Company, with headquarters at 1215 Lumber Exchange Building, Chicago. His appointment takes effect March 1.

George J. Blanton, who for the past four years has been connected with the Engineering Sales Department of the Chain Belt Company, Milwaukee, has been made New York district manager, with offices at 50 Church street.

J. F. Deiter, formerly with the Aluminum Castings Company and the Scovill Manufacturing Company, has accepted the position of superintendent of the foundries of the International Motor Company, at New Brunswick, N. J.

Albert M. Weis, 634½ Cramer street, Milwaukee, Wis., has been appointed representative in the Milwaukee district of Frederic B. Stevens, Detroit, Mich., manufacturer of foundry facings, buffing compositions, platers' supplies and similar foundry necessities. A warehouse has been established at Thirty-fourth and National avenues, Milwaukee, Wisconsin.

W. H. Ellis and **C. B. Clarke,** of Chicago, have joined the sales force of the Hilo Varnish Company, Brooklyn, N. Y. For many years Mr. Ellis was connected with the Forbes Varnish Company and for a long period Mr. Clarke was with the Bridgeport Wood Finishing Company. Their activities will be devoted to the development of business in the industrial field in the Middle West, where each is well and favorably known.

N. C. Hoyles, C. E., has been appointed manager of the Cincinnati branch of the Pittsburgh Testing Laboratory, at 813 Race street, Cincinnati, Ohio. From 1909 to 1914, Mr. Hoyles was manager of the Birmingham, Ala., branch of this company. In 1914 he joined the Canadian military forces, went overseas with the Canadian Engineers, and at the close of the war was mustered out with the rank of Lieutenant-Colonel. For the past year, he has been assistant manager of the Pittsburgh Testing Laboratory's New York office.

Lawrence Wilkerson Wallace was elected secretary of the American Engineering Council at the meeting of the Executive Board in Syracuse, N. Y., on February 14, succeeding L. P. Alford, of New York, who has been acting secretary since the formation of the council in Washington on November 19, 1920. Mr. Wallace has been one of the most active figures in the council and from the time it was organized has been its treasurer. As vice-president of the council Mr. Wallace has been directing the work of the Committee on Elimination of Waste in Industry, one of the principal committees of the council whose scope following the Syracuse meeting will be greatly broadened.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

METALLURGICAL FAKES.

MARCH 7, 1921.

Perhaps the most interesting event of the month in Waterbury manufacturing circles was the lecture before the Waterbury Branch of the **American Society of Mechanical Engineers,** given by **Prof. L. W. Bahney,** formerly of Sheffield Scientific School, and now of the **Scovill Manufacturing Company.**

With a bona fide "gold brick" as Exhibit A, Prof. Bahney ran the gamut of metallurgical fakes as he knew them through actual experience. The gold brick salesman and the get-rich-quick Wallingford received much attention from the speaker. He told about a few men who had gotten up a water purifying device which was supposed to reap fortunes for those who invested in it. After several wealthy persons had sunk considerable money into the scheme, one of the sponsors came to Prof. Bahney with the request to investigate and report on the method. "It took some time to expose that scheme," said Prof. Bahney, "but the men at the head of it were certainly clever gentlemen. I spent much time running it down, and before I got through I was amazed to find they had placed my name on their letter-heads as their consulting engineer."

He told about various methods used to "salt" mines with rocks containing valuable and semi-valuable minerals, thereby making the claim look like a profitable investment. He said that one mineral test at a Mexican mine had proved very satisfactory but that someone "smelled a rat" and another test was asked for. The operation was then watched very closely and it was found that a Mexican, who was helping in the analysis, was casually dropping gold bearing cigarette ashes into the "mash" thus accounting for the presence of the precious metal. The gold was dropping in with the other material apparently as ashes.

X-RAY LECTURE.

Another lecture of interest was that given by **Dr. John S. Shearer,** of the department of physics at Cornell before the Connecticut Valley section of the **American Chemical Society,** at which over 300 members were present. Dr. Shearer told of some of the more recent applications of the X-ray to experiments with metals used in industries. In weldings, he said, the X-ray may be used to discover places improperly welded if there are such. He also said that the grain of a wood may be learned through the X-ray, even after the surface has been varnished. The speaker stated that the X-ray has in no way revolutionized the study of science, having merely expanded it.

Joseph H. Chamberlain, of Amherst Agricultural College, as chairman of the Connecticut Valley section presided at the meeting. There were a number of out of town guests at the meeting some coming from as far north as Springfield. There was also present a number of the faculty and students of Sheffield Scientific School at Yale University.

SCOVILL COMPANY MEETING.

At the annual meeting of the **Scovill Manufacturing Company** held recently, Edward O. Goss was again elected president and general manager. The following directors were elected for the ensuing year: M. L. Sperry, W. E. Curtis, E. O. Goss, John H. Goss, C. M. DeMott, L. P. Sperry, C. P. Goss, Jr., F. b. Kingsbury, and W. S. Fulton. The remaining officials were elected by the directors as follows: C. M. DeMott, treasurer; F. J. Gorse, assistant treasurer; L. P. Sperry, secretary; T. B. Myers, assistant secretary.

The company's financial statement for the year shows the property of the company to be worth $8,858,017.83. The total assets on December 31 were $30,722,659.59, and the net earnings for the year were placed at $983,967.76; surplus, $18,806,266.85.

Following is the financial statement as compared with 1919:

	Assets	
	8,858,017.83	8,472,030.84
	Dec. 31, 1920	Dec. 31, 1919
Land, buildings and machinery as of Jan. 1	$8,472,030.84	$8,870,078.89
Additions during year	1,394,937.19	855,746.55
	9,866,968.03	9,725,825.44
Depreciation	1,008,950.20	1,253,794.60
Cash and loans on call	1,643,626.21	1,509,886.11
U. S. government securities	5,794,223.28	6,637,596.23
Other bonds and investments	3,276,143.42	4,402,635.47
Stocks in other companies	1,074,306.25	75,058.25
Accounts and bills receivable	1,831,919.71	2,125,733.33
Merchandise	8,244,422.89	7,037,955.86
	30,722,659.59	30,260,896.09
	Liabilities	
Capital stock	5,000,000.00	5,000,000.00
Surplus	17,822,299.09	16,227,006.63
Reserves	6,503,162.95	6,000,000.00
Accounts and bills payable	413,229.79	877,864.49
Net earnings	983,967.76	2,156,024.97
	30,722,659.59	30,260,896.09
Surplus Dec. 31	$18,806,266.85	$18,383,031.60

A cash dividend of five per cent was voted by the directors of the Scovill company at a February meeting, dividend to be payable on April 1. It was also voted to distribute to stockholders on March 10, liberty bonds to the value of $50 for every five shares standing in his name.

The **Hoffman Specialty Company,** with headquarters at No 512 Fifth avenue, New York, is to move to this city, according to a recent announcement. The concern deals in valves made by the **Scovill Manufacturing Company** and hitherto has only maintained a branch sales office in this city. The company has arranged for its main offices in the new building of the Waterbury National Bank, which is rapidly nearing completion, and after the transfer of headquarters has been completed the company will maintain a local staff of 50 people. George D. Hoffman, head of the concern, is also expected to make his headquarters in this city. Other branches of the company will be maintained as at present.

H. G. N.

TORRINGTON, CONN.

MARCH 7, 1921.

Major William E. Besse, superintendent of the Torrington branch of the American Brass Company, has returned from a six-week visit to his native country, Switzerland. He made the trip to visit his brother, who has been seriously ill.

The **American Brass Company** has sold the Hayes building on Water street to **Henry Zele.** The company acquired the building about a year ago. The sale to Mr. Zele, it is understood, involved approximately $25,000.

The **Torrington Homes Corporation** has filed a certificate of reduction of capital stock. The authorized capital of the corporation was $500,000 and has now been reduced to $15,000. The certificate is signed by F. L. Braman, C. H. Alvord, F. J. Damon, William W. Cotter, James A. Doughty, F. M. Travis, F. R. Appelt and James H. Graham, executives of the principal companies in Torrington.

The stockholders of the **Hendey Machine Company** at their annual meeting February 2 re-elected the following directors: Frederick F. Fuessenich, Charles H. Alvord, Robert C. Swayze, William E. Fulton, W. S. Fuller, Charles S. Palmer and Frederick W. Fuessenich. The directors elected the following officers: President and treasurer, Charles H. Al-

vord; vice-president, Robert C. Swayze; secretary, F. N. McKenzie; assistant treasurer, Frederick W. Fuessenich.

With hundreds of men out of work and the shops working on short time, the employment situation in Torrington threatened for a time to assume serious proportions. The town and borough helped to temporarily relieve conditions by providing special municipal work to aid some of the family men who were urgently in need of funds. The coming of Spring, it is expected, will see conditions greatly improved.—J. H. T.

HARTFORD, CONN.

MARCH 7, 1921.

Speaking in regard to particular industries, **Thomas J. Kelley,** secretary of the Hartford Manufacturers' Association, in an interview in which he said that "the industrial situation in Hartford, while not materially different from what it was a month ago, shows increasing signs that the deflation process is reaching its foundation," asserted that the automobile industry showed hopeful signs of recovery. As Hartford, under normal conditions, is an important automobile accessory center, the favorable results of such signs are expected to become felt here soon.

The typewriter industry is in a comparatively good shape, and is in better condition than similar factories in other cities. Some manufacturers look with hope upon the new tariff policy of the incoming national administration, according to the secretary.

Continuing, he said:

"Hartford manufacturers have not stopped laying off men but the process is diminishing and here and there a manufacturer is taking back key men, preparatory to gradual expansion. This expansion of activity is not yet definitely in sight, but there is a somewhat definite expectation that industry is booked for better days in the near future.

"Some manufacturers are keeping their working force together by making stock, others are repairing their machinery and rearranging their factory equipment and using their men for that purpose. All are trying to bridge the slow period by doing something that will prove useful when the situation changes." W. A. L.

CLEVELAND, OHIO

MARCH 7, 1921.

While surface indications may be to the contrary, the current underlying general business conditions here is flowing toward a more normal channel in the last few weeks, and approach of Spring is bringing a decided revival in inquiries from all directions. Though the metal industries have not felt any direct effects from this change as yet, the fact that general manufacturing is on the upgrade once more is sufficient to inspire some real confidence for the immediate future, something that could not be said at the beginning of the year, or even a month ago.

Probably the best indication of a return toward normal is the reopening of plants here that were closed entirely, and the resumption of more working time by those that have been operating part time. This is more nearly true of general manufacturing than of the automobile trade, one of the great outlets for the metal industry here. However, this varied view simply illustrates a difference in the manner of handling the present situation.

The **White Company,** for example, has been operating at maximum production right along until January, when it operated a five-day week, and since February 1 a four-day week. For March the night force will be discontinued, and a half-time program inaugurated for the day force, so that all employes will work three days a week. The plan, in the opinion of **W. T. White,** president, will keep the organization in shape for the time when added production will need it.

The **Penn Mold Company** at Dover has resumed operating full time after being closed several weeks.

The **Boston Gear Works** has established headquarters here and will have a distributing centre from Cleveland for the surrounding territory.

Settlement of disputes in the plating branch of the industry has not been as satisfactory as might be. Operatives struck against a decrease in wages and were reported to be going back to work at the old scale, $1 an hour. This statement comes from the Metal Polishers Union. It is denied by **F. C. Miller,** head of the **Ohio Plating and Manufacturing Company,** who stated that all members of the **Jobbing Shop Platers' Association** are holding firmly for an acceptance of 75 cents an hour by workers. None of the members has agreed to pay the higher scale, according to Mr. Miller.

Wage disputes between operators of foundries and molders' union officials has not been settled. These plants have been working one-quarter time or less at the old scale, 90 cents an hour. It was proposed to pay 75 cents an hours. This proposal was rejected by union interests. Meanwhile plants producing plumbing supplies and similar materials have gone back to the open shop and nine-hour day, with a 10 per cent reduction in wages.—C. C. C.

PROVIDENCE, R. I.

MARCH 7, 1921.

The metal industries of Rhode Island are showing a material improvement in business conditions and are steadily advancing toward normal operation. As a result, the employes are increasing in numbers in the plants and the manufacturers are more optimistic as to the future than they have been for several months. The volume of business in many of the lines of manufacture represented in the metal group in Rhode Island is showing a very general betterment, and gains are looked for in such lines as have not already started up. The gain is particularly noticeable in the jewelry manufacturing and allied plants.

The sheet metal workers are among the busiest of any of the trades; in fact, they are the busiest that they have been in more than a year, due largely from the reviving activity in building operations, both new structures and repairs, calling for large amounts of architectural and construction sheet metal work. Heavier lines, like foundries, etc., while showing marked improvement during the last few weeks, have not advanced with the same volume and promise as the lighter branches have.

Col. S. O. Bigney, a manufacturing jeweler of Attleboro, speaking for the jewelers of New England, sounded a note of warning to the jewelry trade, relative to the competition to be expected from Germany. He declared that he was convinced from evidence in his possession that an attempt to undermine American jewelers even in their home market is under way. He pointed out that the orders for one-twelfth of a dozen of many different designs have become so frequent as to attract attention, especially as they are not followed by later orders. He claims to have further located orders given to designers and engravers for work at their own price, but nothing has ever been heard from the samples that they supply.

The contract for all the sheet metal work on the new Biltmore Hotel, now being erected at Washington, Dorrance and Eddy streets, has been awarded to the Anderson Sheet Metal Company of Providence.

The American Standard Watch Case Company, Inc., of Providence, has filed articles of association and received a charter from Secretary of State under the laws of Rhode Island. The concern will make watch cases, tools and other articles of jewelry, with a capital stock of $300,000. The incorporators are Alexander Y. Cunningham, Rudolph Schwarz, Nathan E. Eisler, Aime Paul Duchesneau and Norman K. Winston.

R. Plews & Company, Central Falls, manufacturers of tin cylinders and sheet metal goods, are running full time and have many orders ahead for the products of their plant. The difficulty experienced some time ago in getting the necessary material used in the business has been entirely overcome, and everything is running along smoothly. W. H. M.

TRENTON, N. J.

MARCH 7, 1921.

Morris Berman, wholesale metal dealer, of Camden, has filed a voluntary petition in bankruptcy in the United States District Court at Trenton, and the case has been referred to Referee in Bankruptcy S. Conrad Ott for adjustment. The sudden decline in the metal market is ascribed as the reason

for the financial troubles. Berman says his liabilities are $43,000, while his assets are $57,000. The latter figure is based on prices which Berman paid for material he has on hand and which has since suffered a severe slump in values. Notes make up a large part of Mr. Berman's liabilities. Included in the assets is the plant at Camden and the machinery.

The metal industry is feeling the effects of the business slump and the majority of the plants are being operated but five days a week. The **Trenton Brass and Machine Company,** one of the largest concerns of its kind here, is running but five days a week. Other concerns working the same number of hours are the **Skilman Hardware Manufacturing Company, Billingham Brass and Machine Company, Jordan L. Mott Company, John A. Roebling's Sons Company, The Trenton Emblem Company.** The **Ingersoll-Trenton Watch Company** have laid off a number of employees temporarily. In a notice to each of the employees the company stated that owing to readjustment conditions and the necessity for competing with other concerns at a lower figure on goods, it was necessary to dispense with the services of the employees, but it was hoped that they would return to their positions when the plant was started again.

The **Jonathan Bartley Crucible Company** is operating on a fifty per cent basis, but hopes to be running full handed by the coming Summer. An official of the company informed a representative of the METAL INDUSTRY that there had been an improvement in business conditions since the first of the new year, and that this was very encouraging.

The **Trenton Zinc & Chemical Company,** recently organized to take over the plant of the **M. M. & S. Metal Company,** has negotiated with **Pierce & Skoogmark,** engineers, of 140 Nassau street, New York, to plan and supervise the construction of new units to the plant on Fall street. The New York firm were consulting engineers in the construction of the plants of the **New Jersey Zinc Company** and other big concerns. The new units will be constructed without any detriment to the operation of the Trenton plant.

International Automobile Accessory Company, of Jersey City, has been chartered at Trenton with $150,000 capital to make auto accessories. The incorporators are Albert J. Elliott, Frederick B. Bard, New York, and Alice V. Blois, of Jersey City.

Auto Detecto Corporation, of West Hoboken, has been chartered at Trenton with $50,000 capital to make automatic devices. The incorporators are: John C. Ludwigsen, Secaucus; Frank D. Boulanger and Edward C. Gunther, of West Hoboken.

Holly Manufacturing Company, of Newark, has been incorporated at Trenton with $50,000 capital to deal in metals. The incorporators are Everett D. Holly, Arlington; Elmer E. Holly, Lyndhurst, and Walter A. Mayer, Rutherford.

The **Bergen Point Brass Foundry,** of 161 Hobart avenue, Bayonne, has been incorporated by Arthur W. Lindberg, of 125 West Sixth street, and others, to engage in the brass business.

Albert Company, of 810 Broad street, Newark, has been incorporated with $10,000 capital to manufacture hardware. The incorporators are Nathan H. Berger, Sarah N. Search and Florence L. Nichols, of Newark.

Barrasso & Blasi, manufacturing jewelers of 112 Arlington street, Newark, will erect a new factory at 31-33 Governor street, that city, at a cost of $30,000. The building will be brick, two and a half stories, and will be used for the manufacture of jewelry.

A voluntary petition has been filed by **Mitchell Cohn,** of West New York, N. J., for the Liberty Lamp Works, Inc., of 112 Grant avenue, Harrison. The company gives its liabilities as $7,820, of which $2,861 is unsecured, and its assets as $5,090. The petition has been referred to Referee George R. Beach.

Connecticut Dynamo and Motor Company, of Irvington, N. J., has been incorporated at Trenton with $150,000 capital to make electrical appliances. The incorporators are Gerald Hannay, Irvington; Harry J. Brewer, of New York, and Donald B. Munsick, Newark.

Metal Crafts Company, of 619 Bloomfield avenue, Bloomfield, has been incorporated with $125,000 capital to manufacture lighting fixtures. The incorporators are Alfred P. Siedell, of Montclair; Edward W. Poerner, of East Orange, and Andrew Poerner, of Newark.

Auto Locking Device Company, of Camden, has been incorporated at Trenton to manufacture auto locks. The company has a capital of $125,000 and the incorporators are August A. De Graeve, Bedell Wills, of Haddonfield, and Edward E. Ford, of Camden.

Dunthey-Smith Company, of Newark, has been incorporated at Trenton with $100,000 capital to deal in tinners' supplies. The incorporators are Harry G. Clayton, Spring Lake; Harvey L. Dunphey, Newark, and Ralph W. Smith, Irvington.

C. A. L.

ROME, N. Y.

MARCH 7, 1921.

Business in the metal industry plants of this city during February showed but little signs of general improvement, but the opinion seems quite general that by the first of April a marked change for the better will have taken place. However, a survey of the situation and talks with various manufacturers develope the fact that no one can tell with any degree of certainty when business will "come back." It is a fact that all of the factories in Rome are doing everything possible to get every order that can be obtained. The management of the factories feel very keenly the hardship to their employees, due to small pay or no pay, particularly at this time of year. Two or three of the largest factory managers have said very frankly that they are now operating at a loss. They are trying to take orders to keep their workmen busy, but the only way that orders can be obtained today is by cutting prices and taking business at almost "any old price," and this means taking business below cost and losing money each month that this is done, it is stated.

Speaking of the prospect of reducing selling prices and wages, one manufacturer said: "At the present time I have about 600 employees in my plant, and a few months ago I had over a thousand. If I continue to pay present wage rates, I can not lower my selling prices any more, because I am losing money at the present time on what I am selling. I believe if my men would offer to take a 25 per cent. reduction in their wages that I could secure enough more business so that I could re-employ at least a part of my former employees, who are now out of a job. I have been thinking this thing over for a long time, and I believe, not only in fairness to the man in the factory, but in fairness to the man who is out of the factory and out of a job, that I must bring my costs down in order to try to get more work for the men and not lose so much money that my stockholders will fire me out of my present job."

A manager of one of the local factories states that so far as he can learn, the majority of his competitors have already reduced wages by from 20 per cent. to 30 per cent. An announcement of a reduction of 20 per cent. in wages throughout the metal trades factories of this city is expected at some time in the near future.

At the annual meeting of the directors of the **Rome Manufacturing Company** the following officers were elected: Chairman of the board, **W. B. Johnson;** president, **P. C. Thomas;** vice president, **Barton Haselton.**

The directors of the **Rome Wire Company** at their annual meeting re-elected **H. T. Dyett** president and **F. M. Potter,** vice president.

The directors of the **Rome-Turney Radiator Company** elected the following officers for the ensuing year: Dr. W. L. Kingsley, president; Barton Haselton, vice-president; treasurer and general manager, George W. Turney.—M. J. D.

ROCHESTER, N. Y.

MARCH 7, 1921.

For the first time in many months rays of optimism are permeating some of the metal-using manufacturing concerns in this city. Inquiry of superintendents and purchasing agents of the larger plants incline to the belief that business conditions are indicating improvement, and that the advent of spring and the Harding administration will inaugurate better feeling and better times.

A notable improvement in business conditions has been observed by officials of the **Taylor Instrument Companies,**

Yawman & Erbe, the brass and iron foundries, the **Erdle Perforating Company,** the stamping plants, and several of the plating establishments about the city. These unerring observers claim to see the eventual arrival of a greater demand for manufactured products and that once the ball begins to roll the restoration to normal conditions will quickly be reached.

The **Bastian Brothers Company** now occupy their new plant at 1600 Clinton avenue north. The firm entertained patrons and friends following the first meeting of the board of directors in the new structure. The concern has suffered but little in the general depression, and a full force of employees is kept busy without loss of time or reduction in the wage scale. The company manufactures advertising specialties, signs, emblems, jewelry, engraved stationery, convention badges, buttons and the like. Almost every known metal enters into the making of their products. T. E. Bastian is president, W. F. Durna, secretary, and F. J. Bastian is vice-president and treasurer.

An involuntary petition in bankruptcy has been filed by creditors against the **Powelson Foundry and Manufacturing Company.** The property is valued at $3,000. Burlew Hill, of this city, has been named receiver.

A strike of toolmakers is on at the plant of the **Ritter Dental Manufacturing Company** in West avenue, owing to the refusal of the men to accept a reduction of wages. The plant is picketed, and one or two disturbances have found an end in police court. It is claimed that 290 of the Ritter employees are members of the union.—G. B. E.

MILWAUKEE, WIS.

MARCH 7, 1921.

A substantial improvement in business conditions in Milwaukee has been reflected in its metal industries. The majority of shops and foundries in this city are rapidly resuming production after a period of almost complete inertia. The automobile companies in particular are shifting back into high gear. The **Nash Four** plant reports that it is daily taking on more men. The Milwaukee assembling works of the **Ford Motor Company** started up again late in February, turning out the normal volume of cars, or about 115 a day. Automobile parts concerns are operating at about 50 per cent of their usual capacity.

New financing has been undertaken by a large number of industrial corporations. The latest company to enter the field in quest of funds is the **Aluminum Goods Manufacturing Company,** of Manitowoc, which issued $3,500,000 of ten-year gold notes on March 1 through a syndicate composed of the Union Trust Company, Pittsburgh; Bankers Trust Company, New York; Continental and Commercial Trust and Savings Bank, Chicago, and the First Wisconsin Company, Milwaukee. The notes were sold on a 7.8 per cent basis. A sinking fund will retire $120,000 annually.

Directors of the company are **Arthur V. Davis,** president of the Aluminum Company of America, Pittsburgh; **J. E. Hamilton,** Two Rivers; **Roy A. Hunt,** vice-president of the Aluminum Company of America; **George Vits,** president; **Albert J. Vits,** general sales manager, and **Joseph Koenig,** vice-president.—J. V. L.

BALTIMORE, MD.

MARCH 7, 1921.

The annual report of the **Baltimore Tube Company,** covering operations for the year ending December 31, 1920, and just made public, shows that earnings were sufficient to meet dividends on the preferred stock and to set aside the customary reserves for depreciation, taxes, etc. The profits shown were made during the earlier months of the year, reaching their maximum in July, when, with the tube mill fairly well supplied with orders and the sheet mill running at capacity, the prospects looked promising for a very satisfactory year. The sudden termination of the sheet business, however, brought about first by the total collapse of the automobile industry and shortly thereafter by the slowing down of other lines, and the gradual tapering off of the tube business as the slowing down process gained headway, rendered later months of the year less profitable. In other words, the process of readjustment has affected the brass industry here as it has all others.

Further curtailment of production, together with reduction of working forces and schedules, have been generally in evidence in Baltimore among all lines of industrial activity during February. It was, however, announced the other day by the leaders in the metal industries here that business would begin to pick up in Baltimore this month and that all of the workmen laid off would be again employed.

Among the largest of the plants that have already taken steps to gain lost ground is the **Baltimore Copper Smelting and Rolling Company,** together with the **Baltimore Coppersmith Company, J. Arthur Limerick Company** and the **Central Metal and Supply Company.**

The jewelry trade is beginning to pick up wonderfully in this city, and this of course will cause all other branches to do likewise. A large number of the retailers in Baltimore have recovered from their recent holiday activities, and as a large number of the wealthy families here give expensive presents of jewelry at Easter time, the local trade expects good results.

The **Maryland Culvert and Metal Company** has opened a branch plant on Ridgely Street, near Brush Street, for manufacture of corrugated culverts and is expecting to enlarge its plant shortly. **William G. Baker** is president.

The South Hill Manufacturing Company, which opened its plant on Eastern avenue and Thirty-seventh street about two years ago, are now planning to erect a modern steel building, 150 feet wide by 300 feet long. The new plant will employ about one hundred and twenty-five men, and the new equipment will be of the latest design and motor driven throughout. According to the present plans, brass trimmings will be a big factor throughout the building.

The **James J. Lacy Company** has added 5,500 square feet of foundry space to their present plant and will install in it one air compressor, driven by a 50 H.P. motor; one casting rattler, driven by a 10 H.P. motor, and one double stand emery grinder, driven by a 2 H.P. motor. This addition to their building is intended to take care of the present increase in the manufacture of marine propeller wheels. The company enjoys a reputation for propeller wheel manufacture, with wheels up to 18 inches in diameter being successfully handled. In addition the company turns out a general line of marine castings, electric light and power poles, iron manhole covers and brass trimmings.

Baltimore is included in the itinerary of eleven members of the Confederation of the Chamber of Commerce of Mexico, who will soon visit twenty-six cities in the United States. The Mexican business men, comprising well-known metal manufacturers, will make industrial observations in this city. They will visit the plants of the **Baltimore Tube Company, Central Metal and Supply Company, W. T. Hungerford Brass and Copper Company, J. Arthur Limerick Company** and the **Baltimore Copper Smelting and Rolling Company.**

The foundry shops of the **Baltimore and Ohio Railroad Company** at Mt. Clare, which shut down the first of last month, throwing several hundred men out of work, reopened again on February 16. Only a few departments, however, recommenced operations on that date, but work was found for 2,300 men. The remainder, about 1,500, will be taken back early in March, according to the statement of the shop officials.—W. J. L.

INDIANAPOLIS, IND.

MARCH 7, 1921.

The **Dill Foundry Company** of Rushville, Ind., has been incorporated for $20,000. An addition will soon be added to the new plant, which was erected last summer. The officers of the company are H. G. Francis, president; George Griesser, vice-president, and Will Dill, secretary-treasurer.

Suit was filed in the Federal Court recently by the **Troy Sunshade Company** of Troy, Ohio, asking that the **Zenite Metal Company** of Indianapolis be restrained from infringing on a patent covering the manufacture of automobile wind

shields, of which the plaintiff claims to be the owner. They demand an accounting.

Officials of the **Greensburg Foundry Company** have been granted the petition by the Indiana state secretary to change the name of the company to the **Shelbyville Foundry Company** and increase the capital stock from $5,000 to $50,000. The increase in the capital stock, according to J. E. Evans, treasurer of the company, will mean the reorganization of the working force in order that they may turn out more production to meet the demands of contracts.

Judge A. B. Anderson appointed **Fred J. Byers,** of Kokomo, as receiver for the **Liberty Pressed Metal Company,** of that city, recently after a bankruptcy petition had been filed by the **Van Camp Hardware and Iron Company,** the **Kiefer-Stewart Company,** both of Indianapolis, and **Otis C. Miller,** of Kokomo, creditors of the concern.

The **U. S. Metals Refining Company,** a New York corporation, has withdrawn from Indiana.

Plans are being drawn for **C. & A. Potts & Company** for the construction of a new foundry building at Washington and Blake streets, of Indianapolis. The building will cost, exclusive of equipment, about $45,000. It will be of brick and steel construction with steel sash and a composition roof and will be fireproof throughout.

The **Stevenson Gear Company** has moved into a new location at 942 Daly Street, this city. The company was first organized in 1919 and has had a steady growth since that time. Its new building is a three-story fireproof structure with 55,000 square feet floor space. The company started business two years ago with 2,400 square feet of floor space.—E. B.

DETROIT, MICH.

March 7, 1921.

There seem to be two opinions here in Detroit as to the future outlook of business conditions. One seems to forecast a decided improvement within the next two or three months, while the other foresees only a slight improvement throughout the summer with a decided improvement by next fall. Optimism is prevalent everywhere, although opinions differ as to when it is going to get down to a good producing basis again.

C. Bragg, of the **Michigan Smelting and Refining Company,** says in his investigations, he has found that most of the brass, copper, and aluminum concerns here, and in the immediate vicinity, are operating about 20 per cent of normal. This includes not only concerns that produce automotive snpplies, but those engaged in other lines, such as the manufacture of valves, plumbers' supplies and other products. He believes business will gradually improve right along from now on.

M. S. Schneider, of the **Northern Engineering Works,** is not quite so optimistic for the immediate future, but he does believe that business will be in full swing within the next ten months. He is optimistic so far as the future is concerned, but it seems to be a question with him as to what extent business is going to pick up within the next month or so. He believes the worst is over, however, and that from now on there will be nothing but improvement, but how rapid he cannot say.

The most optimistic expression comes from **E. L. Crosby,** president of the **Detroit Electric Furnaces Company.** He says that while it was very slow with his company during the last two or three months, they have more orders in sight than for the same time one year ago. He reports a considrable improvement in the automotive business, especially among the accessory concerns. After discussing the situation with the heads of many manufacturers, he sees nothing but a steady improvement from now on.—F. J. H.

LOUISVILLE, KY.

March 7, 1921.

Business with the Louisville coppersmiths has been a little dull during the past month, but things are opening up a little and prospects are considered much better. Neither the casting shops nor sheet working houses have been very busy. However, manufacturers have completed inventories, automobile and furniture factories are on a much better schedule, and things are showing a little improvement.

Heavy orders for railroad cars placed by the **Louisville & Nashville, Illinois Central** and other roads, with many of these orders going to companies in the Central States, has resulted in some little demand for material. However, consumption by railroads is being affected by the very dull traffic movement, which is resulting in cars being idle. The Louisville & Nashville R. R., at Louisville, has materially reduced shop forces during the month, as a result of repairs running light.

For a time there were some orders coming into local shops from some of the automobile manufacturers for special castings, but there has been practically no work from such sources for some months past.

The Louisville Railway Company has not been buying much material of any kind, and has let replacements run light, due to a hard fight for an increased fare, which is now in the Federal Court on injunction proceedings.

A big deal has recently been made by the **Kentucky Wagon Manufacturing Company,** Louisville, which has taken over the wagon business of the Studebaker Corporation, of South Bend, Ind., the latter concern to devote its full energies to automobile production, while the Kentucky company will make wagons, automobiles, trucks, implements, as well as drop forgings, foundry work and castings.

Work has started on a new plant for the **National Candy Company,** at Louisville, the general contract being with the Alfred Struck Company. C. S. Evans, of the candy company, reported that a considerable amount of new candy equipment would be installed.

The **Belknap Hardware & Manufacturing Company,** jobbers of general hardware lines, have rejected bids on a $500,000 warehouse building, bids being too high for building at this time.

A. W. W.

ST. LOUIS, MO

March 7, 1921.

The metal and foundry industry in St. Louis has shown but little improvement since the first of the year, according to officials of several companies. There was a slight improvement through January, but a slump arrived again in the February orders, bringing business back to the level of the fall of 1920.

An exception to this case is the **More Jones Brass & Metal Company,** where a full force is at work. Orders increased in January slightly. Seven men were burned at the plant early in February, when the bottom of a crucible broke, releasing a large amount of brass. The vessel was being moved on an overhead crane. One of the men most seriously burned slipped in running and fell in the stream of metal.

In the plating industry, shops are working on a 50 per cent basis, compared with this time last year. Especially is this true in the five largest stove plants, which were closed down for two months. Where polishers have returned, it has been at the 90-cent an hour rate, rather than the $1.12½ asked before the plants closed down. The wage question is expected to be settled by arbitration at national conferences April 1.

The **Bridge & Beach Manufacturing Company,** one of the largest stove plants in the Middle West, will move into their new buildings March 1, where the most modern plating shop in the city has been installed. Equipment has cost several thousand dollars, and all latest devices given a place. The present force will be doubled in the plating department when the new $1,500,000 factory is opened. The force will number between 40 and 50 men in this department.

The **St. Louis Platers Supply Company,** which furnished much of the equipment for the new plant, reported a very good trade, considering the general depression in the plating industry. According to H. J. Richards, material prices have struck their level and will, in his opinion, remain firm. Platers are buying steadily to fill present needs, and in some instances to fill future needs, believing the stuff is a good buy at this time, he said.

Charles K. Schweizer, proprietor of the Excelsior Stencil Works, contemplates a trip to New York and other Eastern cities the end of this month to obtain orders. Present business maintains a full working staff, he reported.

The Musick Plating Works is operating with a short force, and is holding many men for an expected improvement this spring. Several plating firms believe it the best policy to retain their organizations in as near a complete form as possible to be efficiently equipped to handle a large volume of business as trade improves.—W. G. R.

MONTREAL, CANADA

MARCH 7, 1921.

There has been no increase in manufacturing during the month of February in the different lines of metals. The various plants are operating on an average of 50 per cent. All told, readjustment is the cause of all the depression and unemployment. Prospective buyers do not want to buy if the prices are coming down, and manufacturers do not want to stock up if the price is going to be lower.

The Canadian Institute of Mining and Metallurgy will hold its twenty-second annual meeting at the Windsor Hotel, this city, on March 2, 3 and 4. Leading mining men and metallurgists from all over Canada will be present. Besides statistical reports, there will be a conference on metallurgical subjects, visits to industrial plants and sessions of a social nature.

Between six hundred and eight hundred men have been thrown out of work as a result of the closing down of the British **American Nickel Corporation's** mine and smelter on Saturday, February 26, for an indefinite period. This will be followed shortly by the closing down of the corporation's refinery at Deschenes, Quebec, and four hundred men will be out of work in consequence. In a statement issued by the general manager, Mr. Carlyle, of the British American Nickel Corporation, operations have been discontinued owing to the extremely bad conditions of the metal market. The corporation is retaining the nucleus of its former organization so that when the market conditions improve sufficiently production can be resumed on short notice.

Contracts have been let for the rebuilding of the factory of the **Cuthbert & Cohen Company,** recently destroyed by fire, located in Prince Street, Montreal.—P. W. B.

BIRMINGHAM, ENGLAND

FEBRUARY 18, 1921.

Business in all the metal trades has continued to fall off during the past month. The majority of the firms are working short time, though a few are able to keep their people pretty well employed. Manufacturers who cater for other trades in which spring means a revival of business are at the moment faring best. Makers of traveling bags and fancy leather goods are calling for metal mounts and fittings, whilst demands for motoring and cycling accessories, including lamps, have been stimulated by the approach of Easter. But in no department has the seasonal trade reached anything near its normal dimensions. Stocks are heavy and new orders have had very little effect in mitigating unemployment. During the last two or three weeks the rolling and tube firms have had a little more work, but a good deal of their plant is still idle.

Export trade is almost at a standstill on account of the unsatisfactory state of international finance. Cancellations of export orders continue to be received. Merchants and manufacturers for the most part are accepting these cancellations, believing that to attempt to enforce them would be a waste of money in view of the depression with which their customers in foreign countries are faced. Both at home and abroad buyers are evidently holding back in the hope of a reduction of prices. Holders of stocks of manufactured goods, owing to inability to obtain accommodation from the banks, have been realizing at reduced prices, but these reductions have been regarded by many buyers as only the earnest of a further cheapening. Manufacturers, however, are intimating both publicly and privately that when the goods have to be replaced, last year's prices or something very near them will have to be restored unless production costs, especially wages, fuel, maintenance and transport charges can be substantially reduced.

The rate of increase in the number of unemployed registered at the labor exchanges in Birmingham and the neighboring manufacturing districts has been for some time past more than 3,000 a week, and the present total is 127,655. In the Birmingham area alone there are over 52,000 unemployed, and about 20,000 on short time. For the whole kingdom, the total is about a million and a quarter. The Government has decided to increase the pay under the National (contributory) Unemployment Insurance Scheme from 15s. to 18s. (or for ex-soldiers, 20s.) per week for men, and for women to 15s., with half the latter rate for workers under 18 years of age. The period during which the pay will be granted is to be 26 instead of 15 weeks, and the conditions of qualification have been made easier. Over and above the number of registered applicants, there are thousands of others unemployed, and for the assistance of these and other hard cases charitable funds have been started. The Lord Mayor of Birmingham has already collected about £14,000.

Having come to the conclusion that one essential for a revival of trade, especially in export markets, is a substantial reduction of prices, employers are endeavoring to reduce their labor costs. A crisis in the coal trade is threatened on this account.

The Brass Workers' Employers' Association, representing the brass trade in Birmingham and some other centers, has suggested to the Brassworkers' Society the desirability of cutting down wages in the industry by the removal of the last award of 4s. 6d. a week and a reconsideration of the Churchill award of 12½ per cent. on piecework prices and 7½ per cent. on day work rates. The answer of the society as a whole has not yet been given. One or two branches have protested against any reduction, but there is reason to believe that when the parties get into conference a compromise will be reached. Notices of substantial reductions have been given to the workers in the jewelry and electro-plate trades, the hollow-ware trades and some of the engineering trades. Ballots are being taken, and the general belief is that the workpeople will ultimately recognize that low wages are better than none. H.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Howe Fire Apparatus Company, Anderson, Ind., has been incorporated with $150,000 capital stock and has leased part of the factory and equipment of the Buckeye Manufacturing Company. The officers are B. J. C. Howe, president; Benjamin Howe, first vice-president and assistant secretary; L. M. Howe, second vice-president and general manager; A. T. Dye, treasurer, and A. M. Johnson, secretary.

Schlangen Bros. Company, 2435 Irving Park boulevard, Chicago, manufacturers and finishers of brass products, have increased their capital stock from $50,000 to $100,000. Officers of the company are: President, N. A. Schlangen; treasurer, Carl Schlangen, and secretary, E. C. Roos. They manufacture hose couplings, nozzles, lawn sprinklers, machinery, water gauges, brass goods, etc. They are operating a brass, bronze and aluminum foundry, brass machine shop, tool room, stamping, plating, polishing and japanning departments.

The Nassau Foundry and Manufacturing Company, Charles G. Zeilman, Albany, N. Y., president, are establishing a general metal manufacturing business in Nassau, Rensselaer County, N. Y. They expect to begin operations about March 1, making gray iron, brass and aluminum castings, and also doing nickel plating, japanning and pattern making in wood or metal, and machine work of all kinds. They will operate a brass and aluminum foundry, grinding room, casting shop, soldering, plating, polishing, japanning and lacquering departments.

The Detroit Copper and Brass Rolling Mills have increased their directorate from seven to nine men. The directors elected at the annual meeting, January 25, are: A. H. Buhl, L. D. Buhl, G. B. Davis, F. J. Hecker, F. H. Hoffman, L. H. Jones, R. P. Joy, A. J. Peoples, H. D. Shelden; and the new officers are: L. H. Jones, president and general manager; R. P. Joy, vice-president; F. H. Hoffman, assistant general manager; A. J. Peoples, secretary-treasurer; W. P. Bache, assistant secretary-treasurer; J. E. Workman, auditor; Alex-

ander Henderson, works manager. This company also increased its capital stock in May, 1920, from $3,000,000 to $5,000,000. They operate a brass foundry, casting shop, rolling mill, brazing and polishing departments.

Arthur Harris and Company, 212-218 North Curtis street, Chicago, copper and brass founders, have awarded a contract for a one-story plant, 51 x 52 feet, at 213-219 North May street, to cost $6,000. This firm operates a brass, bronze and aluminum foundry, brass machine shop, spinning, brazing and plating departments.

The Michaels Art Bronze Company, 230 Scott street, Covington, Ky., will postpone the construction of a proposed four-story addition, 45 x 64 feet, until early in the spring. It is estimated to cost about $42,000. F. L. Michaels is president. This company operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, brazing, soldering, plating polishing, japanning and lacquering departments.

The Nickel Fabricating Company, Philipsburg, Pa., has been incorporated with a capital of $200,000, to manufacture milk cans, ice cream cans and similar containers under patents which they hold, and also nickel and nickel tubing, and all kinds of welded and drawn and nickel alloy products, which are also covered by patents. The officers of the company are Harry C. Taylor, president; A. B. Curtis, vice-president; D. Ross Wynn, treasurer; Theo C. Johnson, assistant treasurer; Geo. H. Tay, secretary; Harry C. Taylor, general manager; Noel S. Dunbar, sales manager. This concern operates the following departments: cutting-up shop, stamping, tinning and soldering departments, tool room and grinding room.

The A. Garrison Foundry Company, Pittsburgh, Pa., has completed the construction of a new foundry building, 480 by 93 feet. It will enable them to almost double their capacity on chilled rolls and rolling mill machinery. They are also completing a new boiler house. They are also contemplating the erection of a new roll turning shop, though nothing definite will be done on this for several months.

The Surface Combustion Company, Inc., 366 Gerard avenue, New York, manufacturer of industrial furnaces, has acquired the entire rights and interests of the Ratiometer Corporation, Rochester, N. Y. The latter company has during the last few years manufactured Ratiometers in Rochester, N. Y. The Surface Combustion Company, Inc., has established a separate manufacturing and sales organization in its own plant in New York City, where it will continue this business under the name of the Ratiometer Corporation. Other patent rights recently acquired by the Surface Combustion Company, Inc., are the Clark principle of intermittent firing for enameling furnaces and the Langenberg-Fetterly furnace for heat treating armor-piercing shells.

N. B. Payne and Company, 25 Church street, New York, dealers in electric cranes and hoists, have extended their lines of material handling machinery to include the portable conveyors of the A. C. Warner Company, Philadelphia; Chicago automatic coal elevators and McKinney-Harrington package pilers and car loaders. Mr. Edmund Otto, for several years secretary of the Hardware and Supply Company, and prior to that associated with Manning, Maxwell & Moore, Inc., New York, is now associated with N. B. Payne and Company in this branch of their business.

The Celluloid Zapon Company, 200 Fifth avenue, New York, announces the opening of a Philadelphia office in charge of Mr. B. O. Clausen, at 520 Walnut street.

A committee for the protection of the interests of stockholders of the **National Conduit and Cable Company, Inc.,** was formed, February 16, at the request of a number of stockholders of the company. Formation of the committee followed the communications sent February 14 to stockholders of the National Conduit and Cable Company, calling their attention to the fact that "unless the default in certain covenants of the first mortgage bond issue is remedied by March 15, 1921, the banking houses which originally purchased these bonds will ask the trustees to take immediate action." The committee is made up as follows: Chairman, M. P. Callaway, vice-president of the Guaranty Trust Company of New York; Stephen C. Millett, of Millett, Roe and Hagen; Edward W. Harden, of J. B. Colgate and Company; Hugh K. Prichitt, of Prichitt and Company, and secretary, Harold D. Bentley, investment trust officer of the Guaranty Trust Company of New York.

The company has made no statement, but is continuing to carry on its business.

J. B. Reynolds, of the **Indianapolis Chamber of Commerce,** in an address at the second annual convention of the Sheet Metal Contractors' Association of Indiana, at the Denison Hotel recently, prophesied that the "purchasing strike" is about over, and said that all the people could stimulate business by buying.

The New York Brass Foundry Company is now located at 403-405 Broome street, New York City, having removed from 104 Centre street. They have an up-to-date foundry, machine shop and store; the store is for the purpose of selling both wholesale and retail. They manufacture steam, water and hydraulic fittings, also fire equipment. They have just installed a new gas furnace and up-to-date machinery. The floor space of their plant is approximately 10,000 square feet. Mr. Bechtold states that they are getting their share of work but could handle more.

The **Taunton Casting Company, Taunton, Mass.,** has been incorporated with a capital of $25,000, by Joseph P. McKenna, Wilbur E. Forbes, of Taunton, and Einar Owren, of Attleboro. They do casting work, especially for the jewelry and silverware trades, as well as for all lines requiring crucible work, and operate a brass, bronze and aluminum foundry, brass machine shop, casting shop and plating department.

The **United Metal Supply Company,** 322 Seventh avenue, Newark, N. J., has filed notice of organization to manufacture dies, sheet metal products, etc. F. W. Laning and William H. Argue head the company. They do tool making and designing, die casting, experimental work, sheet metal stamping, nickel plating, pattern and model making.

The **Michigan Brass and Iron Works,** Lansing, Mich., are preparing plans for the expansion of their plant. They operate a brass, bronze, aluminum and gray iron foundry.

The **Jacobs Aluminum and Brass Foundry Company,** Lexington, Ohio, was recently incorporated with a capital of $5,000, by S. L. Earhart, B. F. Jacobs, R. L. Swigert, E. M. Presser and M. Harbaugh. They operate a smelting and refining department, brass, bronze and aluminum foundry, brass machine shop, grinding room and polishing department.

Thomas Wildes' Son, Inc., 339 Fifth avenue, New York City, manufacturers of type and babbitt metals, and solders, smelters and refiners of all sorts of white metals and their drosses, have recently incorporated. Their plant smelting and refining department is on Oliver street, Long Island City.

Dwight P. Robinson & Company, Incorporated, a large firm of engineers and constructors of New York, has recently opened branch offices in Montreal in the Dominion Express Building. Alexander C. Barker, vice-president, is in charge of the office. The company is a consolidation of Westinghouse, Church, Kerr & Co., Inc., and Dwight P. Robinson & Co., Inc., and has done extensive construction and engineering work in Canada for the Canadian Pacific Railway, Canadian Salt Company, Canadian Crocker-Wheeler Co., Dominion Government, Ætna Explosives Company, Grand Trunk Railway and others.

The **T. E. Tolleson Foundry Company,** Rockford, Ill., will manufacture brass, bronze and aluminum castings in addition to the iron castings in which it has specialized in the past. W. A. Stephens is manager.

The **Hoffmann Electro-Plating Company,** of Paterson, N. J., has recently acquired an additional 2,000 feet of floor space at 109 Water street, in which it has installed machinery, furnaces, etc., for the manufacture of white metal goods by the Hoffmann Manufacturing Company, which is a co-partnership of the Hoffmann Electro Plating Company conducted by Aug. G. Hoffmann and Theodore Hoffbauer.

A line of novelties, such as ash trays, ink wells and clocks, is now ready for the market and new designs of several different articles are in the course of construction.

The **Midwest Brass and Copper Company, Inc.,** 480 Broome street, New York, has filed schedules in bankruptcy, with liabilities of $145,949 and assets of $83,097, consisting of two notes, $1,106; stock in New York City, Providence, R. I., and

Havana, Cuba, $11,923; fixtures, apparatus, etc., $7,505; accounts, $61,661, and deposits in bank, $900. Among the creditors are: American Copper Products Company, $9,786; United States Copper Products Company, $7,442, and National Brass and Copper Tube Company, $5,121.

The **Ely Anode and Supply Company** has been formed by the incorporation of the business of C. Upham Ely, with offices at 50 Vesey street, New York. Improvements have been made and the company is fully prepared to fill requirements in nickel, nickel anodes, nickel salts, complete plating plants, and all plating and polishing supplies of the same high grades as Mr. Ely has supplied for the past forty-four years. Mr. Ely heads the company as president.

Thursday evening, March 10, will be observed as "Visitors' Night" in the **School of Science and Technology of Pratt Institute,** Brooklyn. From 7:30 to $9:30 o'clock all the shops, laboratories and drawing rooms of the school will be open to the public, giving an opportunity to all persons interested in industrial education to observe the students at work in the various courses and to inspect the results, methods, the equipment and general facilities of the institute. Special efforts are being made this season to offer courses that will be of practical value to men temporarily out of employment, through the rapid changes that have been taking place in the industrial world.

Expansion of business and inadequate facilities in the local plant are the reasons given for the decision of the officers of the **Albrass Manufacturing Company,** Tivoli street, Albany, N. Y., to remove to Coxsackie, N. Y., where the property of the American Valve Company, which is moving into larger quarters, has been secured. The company manufactures plumbing fixtures and other articles of brass. The officers of the company are: President, Edward W. Leahy, Albany; Vice-President, W. L. L. Peltz, Albany; Secretary, John Newton, Slingerlands. The firm operates a brass, bronze and aluminum foundry, brass machine shop, grinding room, casting shop, stamping, plating and polishing departments.

The **Titanium Bronze Company,** Niagara Falls, N. Y., for several years past associated with the Titanium Alloy Manufacturing Company of the same place, has discontinued operations. The company catered to many large concerns throughout the country. John C. McCallum, general superintendent of the company, has formed a partnership with Maurice D. Bensley, proprietor of the Frontier Brass Foundry, Elmwood avenue, Niagara Falls, and they have installed equipment from the discontinued bronze factory at the brass foundry and are handling a large part of the work which the Titanium Bronze Company formerly handled. The new concern is capitalized at $40,000. Their departments are a brass, bronze and aluminum foundry and casting shop.

The **Quebec Brass Foundry,** Des Prairies and Valier Streets, Quebec, Canada, are now operating their brass, bronze and aluminum foundry.

The **Brightwood Bronze Foundry Company,** Springfield, Mass., bankrupt, filed a proposal and offer of composition, offering the following terms of composition to the creditors: To pay all unsecured creditors twenty-five cents on the dollar of their just claims. A meeting of the creditors was held at the Court House in Springfield on February 25th for the creditors to prove their claims, examine the bankrupt and act upon its proposal.

Messrs. Hugo, Richard and Gustav Zeller, having resigned as president, treasurer and general manager, vice-president, secretary and plant manager, and assistant secretary, assistant plant manager and chief chemist, respectively, of the Egyptian Lacquer Manufacturing Company, announce the formation of the Zeller Lacquer Manufacturing Company, Inc., New York, for the manufacture of lacquers, thinners, enamels, solutions and solvents.

The Messrs. Zeller will have associated with them Mr. Edwin M. Squier, former president and now director of the New Jersey Zinc Company; Mr. Hector W. Thomas, director in a number of concerns and senior partner of the law firm of Thomas & Houghton of New York City, and Mr. Harry W. Mack, formerly with the War Trade Board and now a partner in Thomas & Houghton.

OLD CONCERN IN A NEW PLANT

Krischer's Manufacturing Company, moved last September to 255 Calyer street, Brooklyn, N. Y. This concern, which was founded in 1899 by Max Krischer, has grown steadily since that time. In 1912 Mr. Krischer took as partners Charles Rosenblum, Louis Goodman and Harry W. Goodman.

The next addition to their plant is to be a building 200 by 76 feet, which will give them almost a square block of plant area. The company manufactures articles of all descriptions, made of sheet and wire. Some of their products are belt buckles, suspender buckles, locks, keys, etc. All of the work incident to the manufacture of their products is done at the plant. The raw material consists of sheet and wire, which is cut, formed or stamped, and then plated and finished in the required manner. The company operates in addition to its manufacturing departments a plating room, consisting of a number of plating barrels, tumbling barrels, japanning ovens, lacquering, polishing and buffing departments.

NEW ROLLING MILL

It has been stated, but so far without definite confirmation, that the Shaw Metal Manufacturing Company will manufacture copper and brass tubing, sheets, plumbing and lighting fixtures in Seattle, Wash. It is expected that the copper and brass tube plant will be operating within the next six months, and that within a few months after the sheet rolling equipment will be in place. The company expects to obtain its raw materials from Alaska through the Tacoma smelter. Some of the products, which will be made are lighting fixtures, automobile shock absorbers, metal life raft bulkheads, road light reflectors, copper, brass and aluminum cooking utensils, coffee urn covers, spun cornice metal, copper floats, coppersmiths' ferrules, plumbers' supplies, and arts and crafts work. Henry A. Shaw is president, and L. H. Wheeler vice-president. Offices are at 524 New York block, Seattle, Wash.

TRADE PUBLICATIONS

Instructions for the Use of Thermit Welding in Railroad Shops.—A booklet issued by the Metal and Thermit Corporation, 120 Broadway, New York, showing how to make repair welds on locomotives, parts, etc.

Record Anti-Friction Metal.—A little folder issued by the Union Smelting & Refining Company, Inc., Newark, N. J., giving the properties of this type of babbitt.

Research Narratives No. 2 and No. 4, on the Fatigue of Metals and Electric Welding.—Folders issued by Engineering Foundation, 29 W. Thirty-ninth street, New York, telling five-minute stories about the development of the knowledge of these topics.

Metal Melting Furnaces.—A folder issued by the Campbell-Hausfeld Company, Harrison, Ohio, illustrating their iron flask plates, ingot molds, melting pots and steel pouring ladles and skimmers.

Press Working.—A folder issued by the Baird Machine Company, Bridgeport, Conn., illustrating their Double Action Tandem Press, and tumbling barrels.

The Casting of Aluminium.—A booklet issued by the British Aluminium Company, giving instructions for the mixing, molding, melting, finishing and testing of aluminum castings. There are also tables giving additional information of considerable interest to the aluminum foundry. A very useful and interesting booklet.

The Cooling of Quenching Oil in the Heat Treatment of Steel.—A booklet by Kenneth B. Millett, issued by the Griscom-Russell Company, 90 West street, New York, which describes in a very readable manner the various quenching mediums and systems commonly used, the advantages of continuous circulation of the medium and adaptability of their Multiwhirl Cooler to the cooling of quenching oil. Typical installations are shown, giving the layout of the piping with recommendations for the proper size and number of coolers to meet the requirements.

Transporting Materials.—Bulletin No. 9, issued by the American Foundry Equipment Manufacturers' Association, Cleveland, Ohio.

Platers' Equipment.—Catalog No. 5, issued by the Advance Platers' Supply Company, 125 West Illinois street, Chicago.

Ill., illustrating ball bearing lathes, babbitt lathes, brushes and plating equipment.

American Foundry Flasks.—A catalog issued by the American Foundry Equipment Company, 366 Madison avenue, New York., illustrating their corrugated steel flasks, flask bars, taper snap flasks, snap mold jackets, cast bottom plates, mounting frames and pattern mounting compound.

Gas Burning Control.—A sheet issued by the Ratiometer Corporation, 366 Gerard avenue, New York, describing the ratiometer and its underlying principles. It is designed to meet the requirements of automatic proportioning of gaseous fuels, and the air used for their combustion.

Will Tariff Increase Pumice Prices?—An emergency supplement of Rhodes' Colossus, issued by James H. Rhodes & Company, 115 Fulton street, New York. It explains the effect of a tariff on pumice and recommends that no tariff be laid on this material.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Alumium Company of America	$100	$550	$650
American Brass	100	188	195
American Hardware Corp	100	138	143
Bristol Brass	25	15	—
International Nickel com	25	15⅜	15½
International Nickel, pfd	100	80	84
International Silver, com	100	20	—
International Silver, pfd	100	89	—
New Jersey Zinc	100	139	142
Rome Brass & Copper	100	135	145
Scovill Mfg. Co.	100	325	—
Yale & Towne Mfg. Co.	...	240	250

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

COPPER

The most encouraging feature in the copper industry in February was evidence of increased buying for export. In the last two weeks, however, foreign consumers have been less disposed to place additional contracts. One feature of moment has been the larger outgo to Germany; in fact, since the first of January, Germany has purchased more American copper than Great Britain and only a little less than France. In 1920, exports of American copper to Germany were a little less than 35,000 tons, being the fourth largest shipments to any foreign country. Before the war, of course, Germany was the largest foreign customer of American producers. In January this year, exports from the United States to all countries amounted to nearly 24,000 tons, equivalent to about 54,000,000 pounds.

Demand from domestic consumers last month was a disappointment. Early in the mouth, however, there was more interest and for a short time larger sales were made for domestic consumption, but in the last two weeks, the largest home consumers have bought sparingly. About ten days ago, brass mills, wire drawers, and rolling mills were testing the market for various lots of copper ranging from 4,000,000 to 10,000,000 pounds each, intimating that nothing over 13c. per pound would be considered. Subsequently, however, the market was stronger, advancing to 13c. to 13-14c. delivered, but in the last week prices have receded fully half a cent a pound. The largest producers, however, have refused to meet the competition of custom smelters. The latter interests have been aggressive for business, being more interested in preventing accumulation of stocks than in cost of production. In the last few days, moderate sales of electrolytic copper were made in the major market at 12½ to 12⅝ delivered for prompt and March shipment, 12⅝ to 12¾ delivered for April and 12¾ to 12⅞ for May, but very few producers have been willing to sell the June position at 12⅞ to 13c. delivered.

In the outside market prices have ranged from ⅛ to ¼c. a pound above those asked by producers except on electrolytic for immediate shipment, sales of which have been made at 12¼ to 12⅜ f.o.b. refinery, equivalent to 12½ to 12⅝ delivered. For April shipment there have been small sales at 12½ to 12⅝ f.o.b. refinuery and May shipment at 12¾ f.o.b. refinery, equivalent to 13c. delivered.

COPPER STOCKS FINANCED

On February 10, the Copper Export Association consummated its plan for financing 400,000,000 pounds of copper for export, an agreement being entered into between the Export Association and a banking syndicate headed by the National City Company and the Guaranty Company, by which $40,000,000 gold serial 8 per cent notes guaranteed by the producing companies, were issued and offered to the public. The notes are secured by the 400 000,000 pounds of refined copper taken as collateral at a value of 10c. a pound and trusteed by the Guaranty Trust Company. The consummation of this plan by which 400,000,000 pounds of copper were taken from the market created a better sentiment throughout the industry, but until there is a revival in the demand for manufactured products the buying of unwrought copper on domestic account is not likely to be of large proportion. In the latter part of February prices of manufactured copper and brass were reduced ½ to 1c. a pound.

TIN

Conditions in the tin market during February were such as to make for continuously lower prices according to some in the trade, who pointed out that even the reduced pegged price, £203 per pound, at which the Federated Malay States Government has been accumulating tin in order to keep mines operating was done under the expectation of an increased American consuming demand, which, however, was not likely to occur. Cables on the last day of the month announced that the Malay Government had withdrawn as buyer of all tin that could not be sold at its fixed price. The result was an immediate drop of £19 per pound to £184 c.i.f. London. Prices here, fluctuated between the highest levels, Straits 33.50c. Banca 34.50c, American pure 33.00c. and 99 per cent tin 29.37½c. established February 14, and the lowest levels on February 28, Straits, 30.25c.; Banca, 32c.; American pure, 31.25c., and 99 per cent tin, 27.25c. The decline, after the highest levels were touched, was gradual, the lowest being on the last day of the month. The result was a net of 1.75c. on Straits, 2.00c. on Banca, and 1.25c. each on American pure and on 99 per cent metal.

ZINC

Prices of zinc in February, continued to be based upon shipments from abroad and present rate of duty. The zinc industry in this country faces a grave situation in the fact that Germany can produce the metal and ship it here for less money than American producers can place it on the market. After the opening at a decline of ten points to 5.00c. East St. Louis, 5.50c. New York for prompt primary spelter, there was a recovery of five points East St. Louis, February 7, the market in the meantime having become steadier. The recovery in the West, however, was not maintained and by February 11 quotations were off ⅛c. per pound. By February 21, the East St. Louis basis was 4.90c. and after the holiday the decline continued daily, the close being 4.75c. East St. Louis, 5.10c. New York. The market was bare of demand and with cost of importations, partly due to lower silver, above the ruling domestic quotations, a stagnant market existed. The net decline in February was ¼c. per pound from 5.00c. to 4.75c. East St. Louis and 40 points New York, from 5.50c. to 5.10c.

LEAD

Conditions in the lead industry are similar to those in the zinc industry although not so bad, since demand was fairly active at intervals. Prices declined a net of 90 points East St. Louis, 55 points New York on prompt and early shipments in the outside market while the leading interest made five cuts which resulted in a net decline of ¾c. per pound in its basis, East St. Louis and New York to 4.00c. per pound by February 25. Opening outside prices were at a decline of five points to 4.55-4.65c. East St. Louis 4.80-4.90c. New York. Gradually, with the continued decline in silver and the lower prices abroad, quotations here were shaded, the demand being fitful. By the middle of the

month, however, the American Smelting & Refining Company had cut its basis to the level of New York outside prices. The market did not respond and the decline was continued almost daily in both markets, outside figures on February 28 being nominally 4.00 New York, 3.90-4.00 East St. Louis, while the leading interest quoted at 4.00. Considerable inquiry was developed at the close.

ALUMINUM

Outside market prices in February, following considerable activity in the early days, were advanced February 4, to 25-26c. virgin 98-99 per cent; 22-23c. remelted 98-99 per cent and to 20.50-21.50c. for remelted No. 12. By February 10, the market having turned dull in the meantime, there was a decline of 1.00c. per pound and with no improvement in demand by February 16, another reduction carried to 23.50-24.00c. virgin 98-99 per cent, while remelted 98-99 per cent and No. 12 remelted were held at 20.50-21.50 and 19.50-20.50c. respectively, these figures prevailing at the close were about ½c. below the opening.

The producer's schedule on February 1, showed no change from the January closing 28c. for virgin 98-99 per cent, 27.30c. for No. 12 alloy and 42.60c. for sheet 18ga and heavier f.o.b. plant, but on February 7, virgin was quoted 28.20c. Almost immediately, however, there was a return to 28c. and the schedule at the end of the month showed no change from the opening level. Total importations of aluminum in 1920 were heavy, with 17,886 tons arrivals as compared with 7,876 tons received in all of 1919. Total exports in 1920 amounted to 4,196 tons as compared with the total outgo in 1919 of 2,235 tons. Stocks in bonded warehouses at the end of 1920 amounted to 1,760 tons.

ANTIMONY

After advancing five points January 31, to 5.25c. duty paid for spot carloads, there was no change in antimony prices until February 17, when the recovery was lost on that day, partly due to the lower price of silver but principally to absence of demand. The market over the remainder of the month was quoted 5.20c. duty paid New York for carloads, 5.37½-5.62½c. jobbing lots. It is interesting to note that one year ago, antimony was selling at 11.62½c. duty paid New York for carloads. Total importations in 1920 were 11,856 tons, almost double estimated normal requirements, 6,700 tons, before the war.

SILVER

The silver market for bars of foreign origin in February, declined to the lowest price, 54⅜c. February 25, that has been reached since 1916. The highest level in February was 66½c. per ounce on the third day, thus fluctuations from the highest to the lowest levels covered a range of 12⅛, but the net decline from the opening, 57¾c. to the closing 56¼c. February 28, was only 1½c. Total importations during 1920 were $88,060,041 as compared with 1919 total importations of $89,410,018, while total exports in 1920 were $113,616,224 as compared with $239,021,051 in all of 1919. Bar silver of domestic origin, of course, remains pegged at 99½c. per ounce. The U. S. Mint on February 21, renewed the coinage of silver dollars, the first minted since 1905, to replace those broken up and sold to the Orient under the Pittman act, amounting to about 207,000,000 ounces, all of which must be replaced in the U. S. Treasury. With 37,000,000 on hand, it will be necessary for the Government to purchase about 172,000,000 ounces additional.

QUICKSILVER

Following the advance of $5 per flask of 75 pounds to $50 per flask on January 31, there was no further change in the price of quicksilver, until February 28, when a decline of $3 to $47 occurred. The market is very dull. Exports in 1920 totalled 116,493 pounds, valued at $129,993, as compared with exports in 1919 of 683,004 pounds valued at $817,328.

PLATINUM

After declining $2.50 per ounce to $70 on January 31, there was no further change during February to the 26th, inclusive. Demand for the metal is light. Total importations during 1920, including unmanufactured ingots, bars, plates, etc., and vases, retorts and all others, according to U. S. Commerce statistics amounted to 81,741 troy ounces valued at $8,568,907 as compared with 1919 importations when 54,572 ounces came in.

OLD METALS

A further slump in business generally, during second fortnight in February, developed a pessimistic outlook in the trade and prices again receded on nearly all items listed. Aluminum scraps for a short period were in active demand, but prices asked, combined with high freight rates, made business unprofitable and demand quieted down with clippings up 1c. to 13c. per pound and old cast up ½c. to 10c. Old sheet at 10c. and clean turnings and borings at 6.50c. were unchanged. Coppers, at the end of February were off ½c. each, for light copper to 8c. and for uncrucibled copper at 9c. while strictly crucibled declined ½c. to 10.50c. per pound. There was a ¾c. decline each, on radiators to 4.50c.; on brass turnings to 5.25c.; on electrotype ¼c. to 3.50c.; on old zinc ¼ to 3c.; on new zinc ¼c. to 3.50c.; tea lead to 2.25c. while No. 1 pewter was down 1c. per pound to 17c.

FEBRUARY MOVEMENT IN METALS

Copper:	Highest	Lowest	Average
Lake	13.50	13.00	13.335
Electrolytic	13.25	12.25	12.793
Casting	12.62½	12.12½	12.447
Tin	33.50	30.25	32.467
Lead	4.90	4.00	4.536
Zinc (brass special)	5.15	4.90	5.08
Antimony	5.25	5.20	5.231
Aluminum	26.00	23.50	24.50
Quicksilver (per flask.)	50.00	47.00	49.842
Silver (cts. per oz.) Foreign	63.37½	54.37½	59.324

WATERBURY AVERAGE

Lake Copper, Average for 1920, 18.06. 1921, January, 13.75—February, 13.50.

Brass Mill Zinc, Average for 1920, 8.33. 1921, January, 6.05—February, 5.50.

Metal Prices, March 7, 1921

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, delivered	12¼
Lake, carload lots, delivered	12¾
Casting, carload lots, delivered	12¼
TIN—Duty free.	
Straits of Australia, carload lots	30½
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.00
ZINC—Duty 15%.	
Brass Special	5.25
Prime Western, carload lots	5.10
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb., f. o. b. factory	....
Ton lots, f. o. b. factory	23½–28½
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	5.20
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	44.00
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained	$0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25–$1.35
BISMUTH—Duty free	2.25– 2.35
CADMIUM—Duty free	1.40
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained	1.50
COBALT—97% pure	Nominal 4.50
QUICKSILVER—Duty 10% per flask of 75 pounds	47.00
PLATINUM—Duty free, per ounce	70.00
SILVER—Government assay—Duty free, per ounce	.99½
GOLD—Duty free, per ounce	20.67

Metal Prices, March 7, 1921

INGOT METALS

Silicon Copper, 10%	according to quantity		49	to55
Phosphor Copper, guaranteed 15%	"	" "	24½	to34½
Phosphor Copper, guaranteed 10%	"	" "	24	to34
Manganese Copper, 30%	"	" "	50	to56
Phosphor Tin, guarantee 5%	"	" "	38	to48
Phosphor Tin, no guarantee	"	" "	43	to53
Brass Ingot, Yellow	"	" "	9¼	to 9¾
Brass Ingot, Red	"	" "	12½	to14
Bronze Ingot	"	" "	14½	to16½
Parsons Manganese Bronze Ingots	"	" "	17½	to19
Manganese Bronze Castings	"	" "	36	to39
Manganese Bronze Ingots	"	" "	13	to16
Manganese Bronze Forgings	"	" "	30	to40
Phosphor Bronze	"	" "	24	to30
Casting Aluminum Alloys	"	" "	25½	to27½
Monel Metal	"	" "	38	to..

OLD METALS

Buying Prices		Selling Prices
9½to 9¾	Heavy Cut Copper	11 to12
8½to 9	Copper Wire	10 to11
7½to 8	Light Copper	9 to 9½
9½to10	Heavy Machine Comp	11½to12
6 to 6½	Heavy Brass	8 to 8½
4 to 4½	Light Brass	6 to 6½
5 to 5½	No. 1 Yellow Brass Turnings	6½to 7
8½to 9	No. 1 Comp. Turnings	10 to10½
3½	Heavy Lead	4
3½	Zinc Scrap	4
6½to 9½	Scrap Aluminum, Turnings	7½to10½
15½to17½	Scrap Aluminum, cast alloyed	18.00to19.50
18.50	Scrap Aluminum, sheet (new)	21.00
25.50	No. 1 Pewter	29.50
14½	Old Nickel anodes	16½
22½to24½	Old Nickel	26½to28½

BRASS MATERIAL—MILL SHIPMENTS

In effect January 10, 1921.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.17¾	$0.19¾	$0.21½
Wire	.18¾	.20¾	.22½
Rod	.15¾	.20¾	.22½
Brazed tubing	.29½	..	.34¾
Open seam tubing	.29½	..	.34¾
Angles and channels	.34½	..	.39¾

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.19	$0.21	$.22¾
Wire	.20	.22	.23¾
Rod	.17	.22	.23¾
Brazed tubing	.30¾	..	.36
Open seam tubing	.30¾	..	.36
Angles and channels	.35¾	..	.41

SEAMLESS TUBING

Brass, 21½c. to 23c. per lb. base.

Copper, 22½c. to 24c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	17¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	18¾c. " "
Muntz or Yellow Metal Rod	15¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20¾c.-22c. net base
From stock	22¾c.-26¾c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¼c. to 16¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	23½c. per lb. base
100 lbs. to 300 lbs. in one order	24½c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 11c. basis less 8 per cent. discount.

Casks, jobbers' prices	13c.
Open casks, jobbers' prices	13½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	42½c.
Aluminum coils, 24 ga. and heavier, base price	37½c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	31½c. per lb.
15% "	33¾ " "
18% "	34¾ " "

Nickel Silver Wire and Rod

10% Quality	33¼c. per lb.
15% "	37½ " "
18% "	40¼ " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 60c. to 62c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 59c. to 62c.

NICKEL ANODES

85 to 87% purity	.50c. per lb.
90 to 92% "	.52½c. per lb.
95 to 97% "	.55c. per lb.

Supply Prices, March 7, 1921

CHEMICALS

In Commercial Quantites.

Acid—		
Boric (Boracic) Crystals	lb.	.17
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.03
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.07½
Nitric, 42 deg. Carboys	lb.	.07¾
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump, Barrels	lb.	.05
Powdered, Barrels	lb.	.06
Aluminum sulphate, commercial tech	lb.	.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.05
Sulphocyanide	lb.	.75
Argols, white, see Cream of Tartar	lb.	.80
Arsenic, white, Kegs	lb.	.12
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Calcium Carbonate (Precipitated Chalk)	lb.	.07
Borax Crystals (Sodium Biborate), Barrels	lb.	.08
Carbon Bisulphide, Drums	lb.	.10
Chrome Green	lb.	.75
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.26
Cyanide	lb.	.63
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.40
Crocus	lb.	.15
Dextrin	lb.	.10
Emery Flour	lb.	.07
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.18
Yellow Oxide (Litharge)	lb.	.16
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.55
Chloride, 100 lb. lots	lb.	.50
Salts, single, bbls	lb.	.13
Salts, double, bbl	lb.	.15
Paraffin	lb.	.15
Phosphorus—Duty free, according to quantity		.32–.38
Potash, Caustic, Electrolytic 88–92% fused	lb.	.15
Electrolytic, 70–75% fused	lb.	.14
Potassium Bichromate, Casks	lb.	.15
Carbonate, 80–85%	lb.	.16
Cyanide, 100 lb. cases, 94–96%	lb.	.60
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.07
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.50
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax, bbls	lb.	.08
Bisulphite, tech. bbls	lb.	.06½
Cyanide, 96 to 98%, 100 lbs	lb.	.28
Hydrate (Caustic Soda) bbls	lb.	.05½
Hyposulphite, kegs	lb.	.05
Nitrate, tech., bbls.	lb.	.05
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.75
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.18
Sulphur (Brimstone) bbls	lb.	.04
Tin Chloride	lb.	.40
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.70
Yellow, No. 1	lb.	.30
Whiting, Bolted	lb.	.06
Zinc, Carbonate, bbls.	lb.	.20
Chloride, 600 lb. lots	lb.	.13½
Cyanide	lb.	.46
Sulphate, bbls.	lb.	.04

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	$39.05
14 " 20 " 64/68, "	"	48.65
12 " 20 " 84/92, "	"	45.85
14 " 20 " 84/92, "	"	61.75
Sewed buffs, per pound		
Bleached and unbleached	"	.75

FELT WHEELS

		Price Per Lb.
White Spanish—		
Diameter— 8" to over 16"	Thickness—½" and ¾"	$4.00
" 8"	" 1" to 3"	3.10
" 10" to 16"	" 1" to 3"	3.00
" over 16"	" 1" to 3"	3.10
" 8" to over 16"	" over 3"	3.40
Grey Mexican—		
Diameter— 8" to over 16"	Thickness—½" and ¾"	$3.90
" 8"	" 1" to 3"	3.00
" 10" to 16"	" 1" to 3"	2.90
" over 16"	" 1" to 3"	3.00
" 8" to over 16"	" over 3"	3.30

Above are even diameters. Odd diameters 50c advance.